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Evaluation of human capital as a factor of economic growth with the help of example from IT industry

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<u>Declaration:</u>

I hereby declare that I am the sole author of the thesis entitled "Thesis Title". I duly marked out all quotations. The used literature and sources are stated in the attached list of references.

In Prague on ._____ Pavel Prudnikov

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Introduction

At the present stage of development of the world economy associated with the transition to a post-industrial phase of development, human capital is a key factor of production, economic growth and innovative development in comparison with the financial and natural resources. That is the human capital which today is an indicator of the competitiveness both of the country as a whole, and each company individually.

The global market is characterized by the rapid development of new sectors of the economy and the on-going modernization of the technological processes of various industries, which naturally leads to the fact that the demands on the employee's skills, his knowledge and professional experience, competencies and mobility become higher. In this regard, the development of approaches to the evaluation of human capital in the most innovative sector of the economy (information technology industry) which is the fastest growing over the recent years, acquires high relevance.

The upper management of each company has to assess the impact of human capital on the results of its operations and the development of optimal ways of thereof management. Particularly relevance of the issue under study for IT-companies is due to its duality as part of innovative development: on the one hand, the development of such a company needs to increase human capital and competence to manage thereof, on the other hand - the use of IT-technology becomes a way to enhance innovation processes in other sectors of the economy.

The origin of the theory of human capital can be attributed to 1950-60s. Well-known scientists of neoclassical direction - T.Schults, G.Bekker, J.Mintzer, L.Thoreau, Y.Ben-Poret, U.Bouen - conducted pioneer research therein. In the development of the theory of intellectual capital they relied on the works of the classics of political economy U.Petti, A.Smith, D.Ricardo, K.Marx, who analyzed the nature of the workforce and considered the creative abilities of people and their development as the main source of wealth of the country. Followers of the development of human capital theory also include the following scientists: J.Kendrik, M.Blaug, E.Denison, L.Hansen, F.Machlup etc.

In the 1980s there was an approach of neo-schumpeterians P. Aghion and P. Howitt in which economic growth depends primarily on the level of human capital development. The second approach formulated by R. Lucas emphasizes human capital accumulation as a factor explaining economic growth. Scientists from different countries conducted macroeconomic theoretical and empirical studies of the impact of human capital on the volume of production, people's incomes and their growth rates. For example, the well-

known are the works of M. Abreu, P. Agnone, G .Badinger, R. Barro, P. Romer, L. Thoreau, E. Hanushek, P. Howitt, R. Florax, A. Ciccone, M. Spiegel and others.

R. Barro used empirical data to show a positive impact of the accumulated human capital on economic growth rate (the famous "Barro regression"). J. Benhabib and M. Spiegel conducted an empirical test of the Solow-Swan model for 78 countries in the period 1965-1985 and failed to find a positive relationship between human capital and economic growth. G. Badinger and G. Tondle focused on the endogenous factors of economic growth in 128 EU regions and empirically confirmed the existence of a positive relationship of people's income growth with accumulation of physical and human capital. P. Romer found that human capital is the main prerequisite for innovative activity and contributes to adaptation of technological advances of other countries (provides technological borrowing). M. Temple repeated empirical researches of J. Benhabib and M. Spiegel, and L. Pritchett, and found a positive effect of human capital accumulation on economic growth.

Despite the variety of approaches to the definition and evaluation of human capital, a unified position of researchers in relation to this category has not yet ben formed. Traditionally, the concept of human capital involves the study of the structure of this new source, competitive advantage and the factor of innovative development, assessment and application thereof, but also the impact of human capital on the company's activity results. However, despite the variety of existing approaches to the definition of human and intellectual capital represented in different sources, there is still no generally accepted option for estimation of human capital as a multi-component index.

Theoretical and practical importance of the problem of assessing the human capital in a post-industrial economy, the lack of a degree of scientific development thereof determined the choice of the theme, purpose and objectives of the study.

The purpose of the graduation thesis is to study the assessment of the impact of human capital on economic growth based on IT – sector example. Companies engaged in IT technology are high-tech and have a greater, compared with other industries, amount of intangible assets, and the data in the balance sheet line code "Intangible assets" are more comprehensive.

Realization of this purpose required the following tasks to be solved:

- to reveal economic substance of "human capital" category;
- to consider human capital as a structural element of intellectual capital;
- to define a system of statistical indicators for the study and thereof evaluation criteria;

- to choose a method for estimating human capital of the company, to be adequate towards research objectives;
- to develop an approach to assess the impact of human capital on the market value of the company and the results of its production operations.

The object of study is the human capital of the company (based on IT-sector example).

The subject of the study is to assess the impact of human capital on the capitalization of the company and its economic growth (the main factor of economic growth is a Revenue), with the help of regression models.

Theoretical and methodological basis of the study constitute the conceptual expressions of scientists presented within the neoclassical, Keynesian and neo-institutional research directions of economic theory development on the issues of formation and evaluation of human capital. The paper used modern methods of investigation of the economy, including: analytical, logical, systematic, statistical, structural and functional, and comparative analysis, the institutional approach, correlation analysis and others. As a tool methods of grouping, comparison, structuring, schematization and others were used.

In the first chapter was defined essence of human capital, its role as a production factor, human Capital Structure, realized overview of empirical studies dedicated to the effect of intellectual capital on company activity results.

In the second chapter was examined method of human capital evaluation, appropriate for research objectives, realized description of basic data.

In the third chapter presented the results of assess of the human capital impact on the company's capitalization and the results of assess of the company's human capital impact on the company's economic growth.

Information and empirical basis of the thesis constituted the official data of the World Bank, Eurostat and OECD (Education at a Glance, Education Today, innovation policy reviews of other countries), statistical compilations and financial statements of the largest companies in the world, including IT-companies.

Chapter 1. Human Capital and its Role in Modern Economy

1.1. Essence of Human Capital and its Role as a Production Factor

Modernization of economic development under modern conditions is accompanied by significant modification of both production organization principles and technologies and its factors, in whose structure knowledge potential, accumulated by the society and used in the business practice, creative abilities, high professional skills and competence of employees, i. d. the human capital, are of utmost importance.

The human capital is complex, diversified and variable phenomenon. The human capital researchers focus on different aspects of it, which determines the difference of approaches to the definition of its essence and content and to its evaluation.

The founders of human capital theory are famous American economists, the Nobel prizewinners in economics, G. Becker and T. Schultz[1]. They consider human capital category in the broad and narrow perspective. In the narrow sense, "one of the capital forms is education. Such phenomenon can be considered as a capital, as well as it represents a source of future amenities, earnings or both of it; and it is called "human", because its form becomes a part of individual. In the broad sense, the human capital is formed by investments (long-term placement of capital) into human though expenditures for education and training of labor force at the place of production, for healthcare, migration and searches of information on incomes and prices.

In the Modern Economic Dictionary [2] the human capital is defined as "valuation of potential ability to bring income embodied in the individual. Human capital includes skills, knowledge, experience and abilities".

In my opinion, the human capital should be understood to mean the stock of knowledge, creative abilities, professional skills, health and culture, formed through the aggregate investments, that provides its owner with additional production opportunities, functional competitive edge and growth of prosperity level.

The human capital is a basis for intellectual capital of the company. In the narrow interpretation, intellectual capital is patented results of the research and development activities. The broad interpretation takes into account the role of intellect and personal

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[1] Becker, Gary S. Human Capital. N.Y.: Columbia University Press, 1964.
Shultz T. Human Capital in the International Encyclopedia of the Social Sciences.N.Y., 1968, vol. 6.
[2] Reisberg B. A., Lozovskiy L.S., Starodubtseva E. B., Modern economic Dictionary. – 6th edition. M - INFRA, 2008. - 512 p.

qualities of individual, significance of the market and infrastructural assets. From the one point of view, the intellectual capital is "a part of human capital associated with generation and transfer of information"; from the other point of view, the concept of intellectual capital is wider than human capital, as long as intangible assets, such as patents, licenses, customer relations and loyalty, etc, are generated by means of the former. In my opinion, while considering the role of human capital in the company intellectual capital structure, the one should adhere to its broad interpretation.

Analysis of the impact of human capital and scientific and technical progress on the production started in the middle of the last century (works of R.Solow and E.Denison). Variety of the used theoretical provisions, methods and data to assess the impact of human capital on economic development and analysis of the back impact were accompanied by conflicting results that actualized the study of the causes of this situation.

One explanation of the difference in the results of researches is the use of theoretical provisions which have different explanation of the impact of human capital and technological progress on economic growth. Thus, in accordance with the theory of the accumulation, human capital has a positive impact on productivity and economic development. According to the theory of assimilation, it has impact on technological progress, and the latter has impact on economic growth (emphasis on the relationship between human capital and knowledge implemented in technology[1].

Due to the different theoretical assumptions, the models used in the study are different too. In the first group of models technological progress stimulates economic growth, and in the absence of external factors it slows down the economic development at the expense of decreasing the yield factor of production (including human capital).

While in the second case, the investments in human capital lead to the creation of knowledge and technology without reducing the yield factor of production and the constant change of one of the operating parameters may affect the pace of economic reforms[2]. In this group of models human capital is seen as a factor in the GDP.

Using various theoretical assumptions in the studies was accompanied by the use of different models and therefore conflicting empirical results of assessment of the impact of human capital on economic development. This is due to the following aspects:

[1] George Messinis Valuable Skills, Human Capital and Technology Diffusion: working paper №. 38 / George Messinis, Abdullahi D. Ahmed. –Melbourne, 2008. – 34 p.
[2] James Foreman-Peck Human Capital and Economic Growth: Pakistan, 1960-2003// The Labore Journal of Economics. – 2008. – 13(1).

- model specification used in the analysis (Temple, 1999; Durlaf, Johnson and Temple, 2005);

- measurement errors of the education variable (calculates average study duration as education at the primary school and doctoral studies, which may lead to ambiguous conclusions about the structure of human capital; Barro and Lee, 1993, 1996, 2001; Lee et al., 2005 , De la Fuente and Dominique, 2006; Cohen and Soto, 2007; Lutz et al., 2007; Aghion et al., 2009);

- disregard of qualitative nature of education in the formation of indicators for analysis (Krueger and Lindahl, 2001; Barro, 2001; Serrano, 2003);

- endogeneity and multicollinearity of evaluation results (the presence of not only direct but also back relationship between variables which can influence the results, Beals and Klenov, 2000)[1].

Contradictory are results of analysis of the impact of investment in human capital on economic growth. The low level of investments in higher education in Europe compared to the USA (1.4% of GDP in EU vs 3% of GDP in the USA) at the beginning of the 2000s stands as one of the reasons for the falling behind of EU states in terms of economic growth as compared to the USA today. However, in the first two decades after World War Two European countries have reached a high level of economic growth as compared to the USA, despite investments carried out mainly in primary and secondary education (Aghion et al., 2005). As an example of the countries you can also bring the "Asian Tigers" (Hong Kong, Taiwan, Korea and Singapore), investments of whose were mainly concentrated in primary and secondary education and have yielded economic benefits, which is called the "miracle effect»[2].

Studies that theoretically justified the impact of human capital on the diffusion of technology and innovation, are little (Findlay, 1978; Wang and Blomstraom 1992; Das, 1987; Meyer Faulkis and Nunnenkamp, 2009)[3]. The results of this group of studies also differ (Kokko, 1992; Blomstraom and Kokko, 1998; Sagi, 2002; Keller, 2004; Hoekman and Yavorsik, 2006). There are determined works with the positive influence of human capital on the diffusion of technology (Benhabib and Spiegel, 1994; Krispolti and Marconi, 2005; Kneller, 2005; Girma, 2005; Lai et al. 2006), in others - the effect is ambiguous (Hu and

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[1] Carina Hirsch Schooling, Production Structure and Growth: An Empirical Analysis on Italian Regions / Carina Hirsch, Giovanni Sulis. – Cagliari: Università di Cagliari, 2007. – 25 p.

[2] Md. Rabiul Islam, Human Capital Composition, Proximity to Technology Frontier and Productivity Growth: discussion paper 23/10 / Md. Rabiul Islam. – Australia.: Monash University, Department of Economics, 2010. – 42 p.

[3] Michael Hübler. Avoiding the Trap: The Dynamic Interaction of North-South Capital Mobility and Technology Diffusion – 2009.

Wang, 2000). Only few studies have calculated the minimum level of human capital needed for the catching-up with the technological leader (Borensstein et al., 1998; Crespo et al., 2004; Benhabib and Spiegel, 2005; Kiruelos and Wang, 2005), as well as channels of technology transfer (Findlay, 1978)[1].

The main research question posed by researchers: Do the "capital flows" embodied in technology, allow developing countries to achieve economic growth rates, comparable to those of the developed countries, reducing the time period over which the falling behind from the technology leader will be eliminated. This question is raised in a number of scientific researches (Cocoe et al., 1996; Griffith et al., 2002, 2004; Girma, 2005) [2]. In the context of the availability of such a mechanism, it can be determined as one of the bases for technological development.

Reducing the falling behind from the technology leader, and thus the innovative development can be achieved by creating technologies both inside the country, and by borrowing thereof from more developed countries. At this for production of innovations workers with higher levels of skills and abilities are needed (especially with respect of requirements for the qualifications of the labour force) [3].

Role of human capital in the acceleration of production processes with the help of high technology is being studied both at cross-country and country levels, and at the micro level as well. The number of recent works is little, primarily due to the fact that the tools used in the cross-country and country levels often cannot be applied at the micro level. Among studies at the macro level is the work of John Valley Hiliang Zhao[4] (estimated contribution of human capital to China's economic growth in the period 1978 - 2008 revealed that the effective use of human capital provides 38% of the country's economic transformation), Nikola Gennayoli, Rafayl La Porta, Florencio Lopez-de-Silanes, Andrei Shleifer[5] (investigated determinants of economic development based on database of 110 countries, using a model based on the work of Robert Lucas. It was established that differences in economic development are largely related to the human capital).

However, there are works at the macro level, which did not clearly prove the impact of human capital on the innovation development of the territories. Among these researchers

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[1] Michael Hübler. Avoiding the Trap: The Dynamic Interaction of North-South Capital Mobility and Technology Diffusion . – 2009.
[2] Michael Hübler. Avoiding the Trap: The Dynamic Interaction of North-South Capital Mobility and Technology Diffusion . – 2009.
[3] Carina Hirsch Schooling, Production Structure and Growth: An Empirical Analysis on Italian Regions / Carina Hirsch, Giovanni Sulis. – Cagliari: Università di Cagliari, 2007. – 25 p.
[4] John Whalley The contribution of human capital to China′s economic growth: NBER working paper № 16592 / John Whalley, Xiliang Zhao. – Cambridge: National bureau of economic research, 2010. – 33 p.
[5] Nicola Gennaioli, Rafael La Porta, Florencio Lopez-de-Silanes, Andrei Shleifer. Human capital and regional development – Cambridge: National bureau of economic research, 2011. – 49 p.

are: Terrien and Monen (2003) (cross-country analysis of the data of Canada and four European countries has shown that most of the differences in the results of innovation activity remains unexplained), Maria Adelaide Duarte and Marta Simoes [1] (the hypothesis of the study on the impact of the level of human capital development on the rate of diffusion of technology and the country's technological backwardness based on the analysis of data on seven Mediterranean countries has not been confirmed) .At the micro-level research results are also contradictory. On the one hand, we note works which justified a substantial statistically significant impact of human capital on the innovative development of industries and enterprises. The first group includes the papers of Carina Hirsch and Giovanni Sulis[2](proved, that those industries which have high level of human capital development grow faster than others, demonstrated a statistically significant positive impact of human capital on the industrial production in the ten macro sectors of Italy), Rajan and Zingales (proved positive statistically significant impact of human capital on the innovative development based on the analysis of data on 37 industries in 42 countries during the 80 - 90s.), Fabio Manca[3] (the analysis of the dynamics of growth in two areas: the north and south with differing stage of development, human capital resources, the amounts of expenses for research and development). The second - the study of Di Liberto (2008) (obtained statistically weak effects of the impact of human capital on economic growth, this is due to the inefficiency of the labour force and not efficient distribution of human capital across sectors).

Undeniable achievement of the human capital theoreticians is recognition of the supreme role of individual in the public production development. The wide spread of this theory on the West and a large number of its followers in our country is caused by the main component of social and economic development – the human factor in its qualitatively transformed form – coming into focus. It is associated with growing role of education, which becomes the key resource and source of the highly developed labor force generation.

Progressively as knowledge society development, the two interrelated tendencies observed in the trends of developed countries' economies can be tracked:

- the share of human capital in the aggregate national wealth of the country is growing, while the shares of production and natural capital are decreasing;

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[1]Maria Adelaide Duarte Human capital, mechanisms of technological diffusion and the role of technological shocks in the speed of diffusion. Evidence from a panel of Mediterranean countries / Maria Adelaide Duarte, Marta Simoes. – Coimbra: Faculdade de Economia da Universidade de Coimbra, 2004. – 41 p.
[2]Carina Hirsch Schooling, Production Structure and Growth: An Empirical Analysis on Italian Regions / Carina Hirsch, Giovanni Sulis. – Cagliari: Università di Cagliari, 2007. – 25 p.
[3] Fabio Manca Appropriate IPRs, Human Capital Composition and Economic Growth

- the contribution of high-tech economic industries, whose success is determined by the contribution of citizens with higher education, into gross domestic product (GDP), and consequently into human capital of the country is growing.

As for the first tendency identified, the clear evidence of proportion between human and production capital in the developed countries having been constantly changing towards the growth of human capital share with simultaneous decrease of production and natural capita shares for the last two centuries are the data on national wealth structure behavior in those countries.

It should be noted that in the middle of XX century the share of production and natural capital in the west countries accounted for 52% of aggregated capital, while at the beginning of XXI – only around 20%.

The relative share of human capital for the same period has grown from 48% to 78%. Herewith, already in 1970 public and private investments into education, healthcare and social security were two times as much as the public and private investments into fixed assets, by 1980 such difference had become three-time, and by 2000s – almost four-time.

Taking into account evaluation and shares of the countries' economies considered, it is possible to draw a conclusion on components of the national wealth in developed counties: human capital – 76-78%, natural capital – 3-5% and production capital – 17-21%. However, there is specific distribution of income between holders of production capital, natural capital and human capital (defined by real unit labor cost that measures a share of income distributed to human capital)

According to expert evaluations, in the most economically developed countries the growth of knowledge and education of the society accounts for in average 60% of national income growth. Herewith, for USA evaluation of GDP share produced by workers with educational qualification of 10,5; 12,5 and 14 years has shown that exactly the third group, i.e. workers with afterschool (higher) education, accounts for more than a half of GDP. The studies conducted by A Maddyson have shown direct relation between economic growth rates and education level of population. It was established that increase of appropriations for education by 1% leads to the growth of country's gross domestic product by 0,35% [1]. Besides that, according to some evaluations, increase of education duration by 1 year in the developed countries leads to the GDP growth by 5-15%.

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[1] Maddison A. Dynamic Forces in Capitalist Development. A Long Run Comparative View. Oxford, N.Y., 1991. P. 37–43

The effect of education on the economic growth was also studied in the EU countries. As a result, clear evidences of education level increase positively affecting macroeconomic performance were received. In particular, such studies have shown that:

1) Increase of secondary school enrolment by 1% leads to annual GDP per capita growth by 1-3%;

2) Increase of average education by one year improves output of products per capita by 6%;

3) Annual growth of human capital by 1% in part of higher education provides increase of GDP per capita growth rates by 5.9%[1].

The similar values were received as a result of calculations performed by Organization of Social and Economic Development (OSED), which have shown that increase of society education by one academic year provides the growth of Member States economy by 5% in short-term perspective and by 2,5 in the long-term perspective.

The average training duration is also constantly growing in the whole world. According to the data, for the period between 1950 and 2011 this index has grown in Japan – from 9, 11 to 15, 1, in Norway – from 12,6 to 17,3, in United Kingdom – from 9,3 to 16,1, in USA – from 12,4 to 16. The leader by this index is Australia – 18 years[2].

In should be noted that growth of human capital role in economy for the recent period of development has been determined not only by increase of training duration and quantity of knowledge mastered. The nature of human production activity has fundamentally changed. The complexity of business processes implemented in the promising technologies developed is constantly growing. It increases requirements to their direct implementers – the citizens, and specifically with working professions. Thus, for example, the accuracy of metal products mechanical processing required in the modern production has reached such accuracy classes, the human manipulators and sensors – hands and eyes – are not able to deal with in principle. Therefore, the modern machine tool worker is the engineer and software specialist, who designs technological program for machine tool with numerical software control according to the drawing and knows metal processing technology, as long as it must be taken into account as technological limitations for indicated program design. It is the person with higher education. The same relates to the worker performing the launch, maintenance and setting of complex electronic devices and technological equipment,

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[1] World Development Indicators database: stat. Newsletter / World Bank, 2014.
[2] Gasper, D., Portocarrero, A. and Saint Clair, A. An Analysis of the Human Development Report "Sustainability and Equity: a Better Future for All", 2011.

assembling the complex products such as aircrafts, etc. It should be noted that increased share of working professions requiring higher education is to the large extent explained by constant growth of labor computerization level. Indeed, the work of more and more workers is associated not with material object direct management, but with its informational image in virtual environment. It relates not only to the theoretic and experimental scientist, but also, for example, for workers in the logistic and bank business, complex technological process operators, etc

The following dynamic external effects of human capital accumulation can be distinguished: growing direct tax receipts to the subjects' consolidated budgets; stimulation of patent activity; increased intensity of informational computer and new production technologies in the economy; growing volume of foreign investments into economy, including the direct ones; growing activity in the area of small business; decreased level of unemployment; increased employment growth rates; increased production (real GRP) and real household income growth rates.

1.2. Company Human Capital Structure

Evaluation of human capital investment efficiency is impossible without clear determination of its structure. While considering possible human capital structure at the level of the company, it is necessary to take into account the fact that each element of it must correspond to the general characteristics of capital, and namely:

- must be accumulated as a result of economical resources utilization and act as a stock;

- must require investments and generate income flow; must provide long-term economic effect that can be measured in physical or monetary terms;

- must affect the company development level;

- must be subjected to the physical and moral depreciation, i. d. must have limited lifecycle, but be a long-term use benefit;

- must require a partial refusal of current consumption for generation of income or benefits from investments made.

The proposed human capital structure is determined based on the role of its separate elements in the current or future company income growth. Indeed, from the point of view of the business owner, the key task is the growth of company activity efficiency, and as a result

– the growth of company profitability and commercial viability, while the growing level of human capital host's income and benefits is the secondary phenomenon necessary for retention of the most efficient employees. The basis of proposed human capital structure consists of the three key components: professional capita, culture capital and health capital.

It should be emphasized that the human capital does not include tangible or physical assets that can be classified as the capital generated by the human or natural contribution. Therefore inborn abilities are the natural contribution and cannot be included into the human capital.

The special role in the company human capital structure is played by the social capital. The area of social relations is considered in the social capital theory by P. Bourdieu. Thus, he emphasizes that the social capital is "the total of real or potential resources associated with having the durable networks of more or less institutionalized relations of mutual acquaintance and recognition – in other words, by membership in the group"[1]. Quality and performance of company relations with customers and authority depends on accumulated special human capital that has a value for both the host and the owner first of all from the point of view of opportunities for business profitability increase. The important thing here is that the relation capital quality is determined not only by the host's personal qualities, but also by the environment, where it is implemented, and namely by the type of company, for achievement of whose goals it is used. In the knowledge economy, the social relations are not only income generation factor, but also promote generation and distribution of new knowledge[2]. Therefore, the social capital, or relations capital, is the necessary component of company human capital.

The culture capital, besides relation capital, includes the codes of conduct, value systems and motivation structure of company personnel. Introduction of these elements is not accidental. The power of company culture is determined by the level of sharing the values declared by the company management or owner. As long as the human capital cannot be separated from its host, the perception of individual's interests through the lens of their values determines the motivation of actions and behavior. The most important thing for business is that the company personnel (company human capital hosts) has the exactly pattern of requirements that would promoted the growth of company efficiency. The bright example of this theory practical implementation is the successfully implemented initiative

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[1] Bourdieu, P. (1986) The forms of capital. In J. Richardson (Ed.) Handbook of Theory and Research for the Sociology of Education (New York, Greenwood).
[2] Makarov V., Kleiner G., Microeconomics knowledge. / Department of Social Sciences, Central Economics and Mathematics Institute. - 2007. - 204 p.

of General Electric's Director J. Welch – transformation of the value systems and its inoculation to the company managers.

The third component of the company human capital is the health capital. For generation of own and company income flow, the human capital host must have the general and professional health, if it is required by specific nature of activity.

Thus, the company human capital consists of three components (professional capital, culture capital and health capital), every of which includes the number of elements. It should be noted that unlike the set of components that is cross functional and characterizes the human capital at the level of individual, company, region or the society in general, the provided element structure is a specific feature of company human capital.

Herewith, at the modern stage of economy development, the knowledge more and more clearly appears in the whole of its structural elements, which allows consideration of it as systemically important element and integration base for human capital internal content (Figure 1).

Figure 1. Interrelation of the human capital key structural
Elements in the knowledge economy
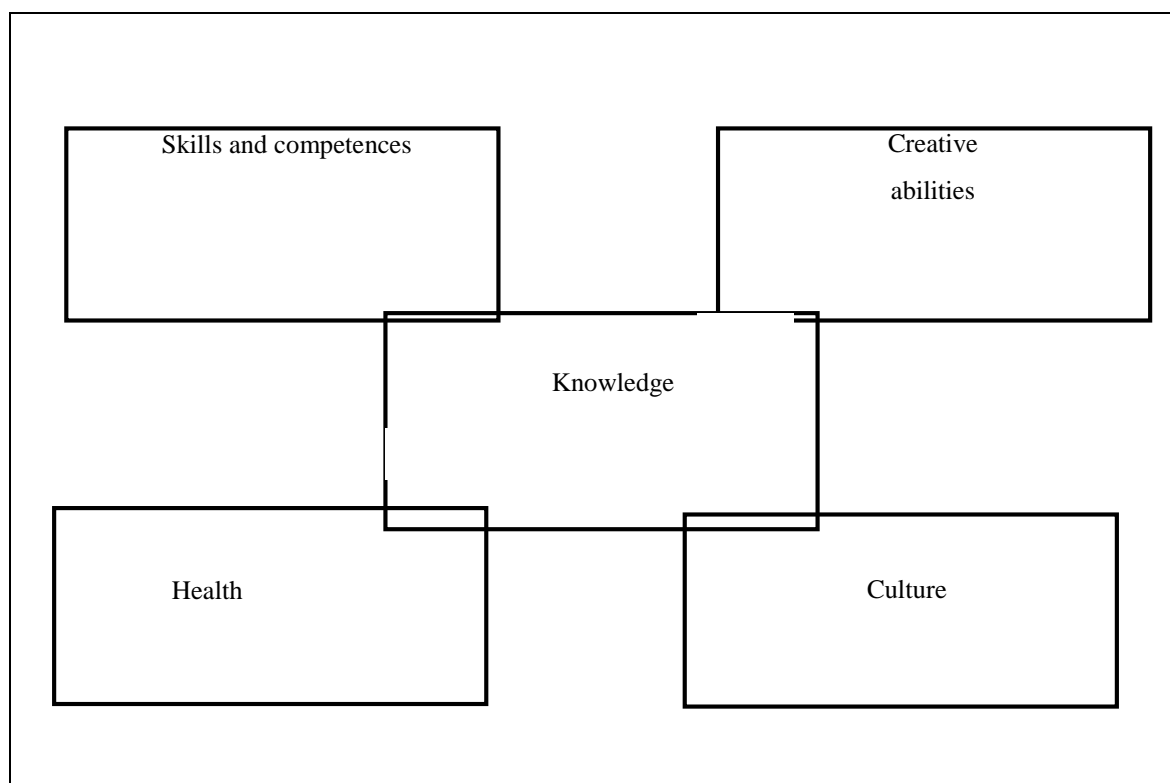
Source: Figure drawn by the author based on the information of the Kurchidis, K. V. Estimates of net value of the human capital / KV Kurchidis // Pedagogical Newspaper. - 2011. - №2.

All civilized countries have already realized the benefit of knowledge capitalization. For example, such companies as Microsoft and Intel earn a few billion dollar income per year from the patents. Therefore, investments into intellectual resource development on the West are growing 2-3 times faster than the companies' fixed assets. In USA the market value of companies busy in the software products development, is higher than a balance sheet value in 7-20 times. Thus, market value of Microsoft is estimated to be USD 259-400 billion, while its balance-sheet value – up to USD 10 billion. A number of companies, such as Skandia (Swedish insurance company) and Dow Chemical, include knowledge (mainly patents and licenses) economic evaluation subsystem.

The worldwide famous Nokia pays a great attention to the development of knowledge sharing culture and introduces incentive schemes of bonuses for using and sharing of knowledge with other employees. Some companies have created databases storing the knowledge of separate employees. For example, HewlettPackard and Sequent Computer have the databases of various documents containing information on efficient sale of company products. These documents are available for internal use by all sales managers. In some companies there are databases storing not a knowledge, but information on people who posses it. Therefore, capitalization of knowledge at the postindustrial stage of society development becomes of utmost importance, as long as the fundament of social development postindustrial stage is the knowledge and development of human abilities, not a physical labor and other production factors; and the most dynamic component of the production force are the intellectual workers, who generate and own knowledge and information.

The genesis of human capital can provide at least two stages, one of which is the formation (investment period) and the other is associated with the use of human capital. Since the formation of human capital is a long-term strategic process of accumulation of the man's productive abilities, which lasted throughout his life, there can be defined several stages.

The first phase is characterized as a period of accumulation of health potential, the acquisition of basic knowledge and skills, socialization of a person. This stage involves several phases: the birth (the period from birth to kindergarten), basic development (education in kindergarten, teaching in secondary school, further education of children), obtaining professional knowledge by training in institutions of secondary and higher vocational education.

The second stage is characterized by the formation of a professional position, the development of professional and personal competencies, and maximized return on

investment in human capital. On the one hand, there is the acquisition of professional competencies, on the other hand, their use in the workplace.

The third stage is called by the investigators the depletion or aging and is characterized as a declining period of social, labour and creative activity, the loss of certain professional skills and competencies, and further retirement.

At each stage of the formation of human capital the investments are made by the individual, family, company, state. The investment in the early stages of the life cycle involves the family and the state, with the continuous development of human capital leading to the need to increase investments for these purposes. Only in the course of employment, during the formation of professional competencies, organizations are investing in the accumulation of specific human capital. In the third stage the value of investments by companies is reduced and the active participation of the state and the population in the maintenance of life of the individual again becomes necessary.

The first two stages are characterized by an increase in the cost of human capital due to the increase in the number of acquired knowledge and skills and their implementation in the workplace. However, in the second stage already there are several possible options for changing the value of human capital. When the population is employed in high-performance intelligent labour, engaged in retraining and advanced training, the cost of human capital can grow while if employment is associated with the sphere of physical labour, the accumulated skills are lost, and the value of human capital can be reduced[1].

The use of human capital is characterized as one of the stages of its circulation, along with the formation. At this stage the knowledge and skills can be realized in the form of labour services in various sectors of activity, thus gaining the cost thereof. The use of human capital is associated with work, with the production of products and services for the society, including those of innovative character. However, it is realized not only in work but also in activities not related to the use of working time - raising children, ancillary services and others. In general, it should be emphasized that at the stage of human capital use the processes of production and consumption of services become more intense, business activity of the population increases, there takes place the environment transformation "to fit oneself" and "tailoring the environment", and interpersonal communication is enhanced. Such transformations are accompanied by revenue growth and individual well-being of the population, the increase in corporate profits and other favourable economic and social

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[1] Kurchidis, K. V. Estimates of net value of the human capital / KV Kurchidis // Pedagogical Newspaper. - 2011. - №2. - Volume 1 (humanities).

consequences. Thus, the process of human capital use can be divided into several stages: the realization of the accumulated potential in work and other activities, gaining economic (wages, profits) and other results. The latter largely influences the launch of the subsequent cycle of reproduction of the human capital, creating conditions to motivate economic agents to invest money in improving the educational and professional level of the population, or, on the contrary, reducing the motivation (in the case where, for example, labour costs are higher than the resulting remuneration). This leads to the need for regulation of the use of human capital by the companies and the state.

Factors influencing the use of human capital can be classified according to various criteria: on the basis of the efficiency of use (effective / ineffective use) and the nature of the effect (internal / external). Internal factors relate primarily to the individual characteristics of the population and partly to the influence of the nearest environment, while the exterior - to the social and economic and political changes at the federal, regional and municipal levels (Table 1).

Table 1. Classification of the factors influencing the use of human capital

By the nature of influence	By influence efficiency	
	Promotes the effective use of human capital	Leading to the inefficient use of human capital
Internal	• training of specialists, highly qualified, able to create new methods of work; • use the experience of the older generations; • fundamental upgrade of the entire system of labour relations.	• excess in downtime hours over the time worked; • failure to comply with the planned tasks; • decrease in the quality of work; • violation of cooperative ties between employees in horizontal and vertical level.
External	• elimination of barriers to professional and territorial mobility; • development and introduction of new equipment and technology, scientific researches; • creating the environment necessary to innovations.	• mismatch between the structure of demand and offers on the labour market; • inconsistency between the prevailing type of employment and the type of economic development; • poor social and economic status of the company

Source: Figure drawn by the author based on the information of the James Foreman-Peck Human Capital and Economic Growth: Pakistan, 1960-2003// The Labore Journal of Economics. – 2008.

The process of using the human capital can lead both to favourable and unfavourable consequences. On the one hand, it can be accompanied by increasing wages and thus income of the population, and lead to higher profits and increased competitiveness of the companies, an increase in social and public benefits, and initiate innovative activity of the population and thus contribute to the innovative transformation of the territories. On the other hand, in terms of employment out of accordance with their specialty, when skills mismatch requirements of jobs, as well as during critical periods in the economy it can lead to the spread of unemployment, informal employment, accompanied by a low-income of the workers. In some cases, there is under-utilization of human capital, which is associated with a mismatch between the level of education of the worker and his professional and qualification status.

1.3. Approaches to human capital management

Despite the fact that the impact of human capital on production processes increases, there are many problems of human capital management:

- inadequate strategic planning of the development of human capital (a significant differentiation - in foreign companies the priority is given to continuous staff training, while in the Russian organizations situational approach dominates);

- low level of applied technologies and tools for the human capital management;

- use the "old management principles" (situation-oriented rather than modern management approaches)

- the existence of the gap between knowledge and reality in the overall management practices (not enough effective use of management methods in practice)[1].

All of the above prevents the implementation of the management objectives, which is to establish compliance of procedures of search, selection, adaptation, training, and staff motivation with the requirements of economic development[2]. Achieving the stated purpose is possible under conditions of constructive cooperation between management and staff members, maintaining the interests of the participants of economic relations. The realization of this objective could lead to an increase in the efficiency of different activities, ensuring

[1] Zhuravlev M. V. Human Capital Management for Innovative Development: a new approach.
[2] Duhnich, Yu. Human capital in the structure of the intellectual capital

the needs of the various structures in the required number of personnel and their educational and occupational structure.

The objectives of human capital management in accordance with the purpose are to determine staffing requirements to satisfy needs for the development of the company, the formation of numerical and qualitative composition of the stuff unit, the adaptation of workers to the demands of the production process, promotion and remuneration of labour, the formation of human resource development system (training and retraining of personnel, providing professional development) and thereby achieve the greatest efficiency of the production process.

In the process of human capital management there can be identified subjects and objects of management. The objects of management are, on the one hand, individuals, groups (their skills and abilities, professional and educational level) and among subjects of management are representatives of the federal authorities, federal forms of government bodies, companies and others.

Each of the designated human capital management subjects has its goals and priorities, which in some cases may not be consistent. The main task is to develop a strategic line of development of the social and economic framework within which one-pointedness and consistency of the key positions of the participants shall be achieved. The difficulties that may arise in the course of implementation of this process can be described as follows: lack of awareness of employees about the strategic goals of the company; lack of awareness of the upper management about the problems of the company; the presence of large amounts of disparate information collected from a variety of accounting, settlement and analysis systems; high labour costs of accounting functions and reports generation; for organizations with extensive organizational structure the problem is to provide complete, timely and reliable information.

Depending on what kind of economic entity is most actively involved in the development of human capital - people or organizations - there are several approaches to the management (table 2).

The use of a certain approach depends on the prevailing social and economic situation, on what stage of development the economic system currently stands, the degree of motivation of the population to change and to participate in investments in improving the educational and professional level. The most acceptable is the realization of   the traditional approach to management, the use of which allows to harmonize   the   interests of employees and   employers and to activate both participants of economic relations.

Table 2. The approaches to the management of human capital

Name of the approach	Characteristics
Competence	• It based on the development of the intellectual capital of the employees; • It corresponds to the strategic principles of the company and society development.
Classic (feasibility or technocratic)	• emphasis on technical training of employees aimed at learning and mastering the basic skills and techniques of labour; • satisfying the needs of the companies in employees of appropriate qualifications, their placement in accordance with the assigned challenges; • managerial solutions are subordinated to the interests of production, an increase in the release of products, maximizing profits.
Traditional (rationalistic)	• responsible attitude to work and high labour productivity on the part of employees in response to the company investments, improvement of technology for selection and training of personnel.
Humanistic	• responsibility for formation of competitive advantages of the company rests with the employees themselves; • effective organization of communication process, highly motivated and flexible management; • flexible path of professional development, the responsibility of the employees themselves per own development, the formation of feedback between upper management and employees.

Source: Figure drawn by the author based on the information of the James Foreman-Peck Human Capital and Economic Growth: Pakistan, 1960-2003// The Labore Journal of Economics. – 2008.

In the transition to an innovation economy in addition to the traditional use the competence-based approach becomes relevant, which aims to develop the intellectual potential of the employees and, thus, their human capital.

Human capital management can be based on different models, the characteristics of which are presented in table 3.

However, at the beginning of the 21st century by using the considered models of human capital management the need for change through the use of strategic guidance and effective management tools is being felt.

Table 3. Models of human capital management

Model	Characteristics
Japanese	• Improvement in product quality and efficiency of the enterprise work; • innovation and creative solutions; • personal development and mutual development; • ensuring stability of employment; • system of remuneration is based on length of service; • improvement of interpersonal relationships (incl. between workers and upper management); • reliance on the ideas of collectivism, • use of psychological leverage over personality.
American	• strategic planning, focused on the creation of competitive advantages for the company; • rigidly organized system of management; • clearly defined responsibility of each employee; • established certain relationships between the use of old and new technology; • mobilization of resources.
Russian	• the use of the systematic and situational approaches to business management; • involvement in the management process both of non-professional of the enterprise, and consumer of goods and services; • separation of management from production and its transformation into a special kind of activity and the emergence of specialists in this field; • the combination of individualism and collectivism as two fundamental qualities of the Russian model.

Source: Figure drawn by the author based on the information of the James Foreman-Peck Human Capital and Economic Growth: Pakistan, 1960-2003// The Labore Journal of Economics. – 2008.

Methods of human capital management can be direct or indirect. Group of models of direct impact on human capital management incorporates methods of direct influence on the process using economic, administrative, organizational, social and psychological methods. Tools of indirect impact involve only the creation of prerequisites for motivating the participants of social and economic relations to enhance the development of their human capital. Thus only economic, organizational and other conditions are actually created, but it

does not mean that they can be used by management subjects and it directly increases the efficiency of formation and use of human capital.

Certain methods of human capital management is often not applied in isolation, but in the system, taking into account the changes occurring in the external environment, the complex structure of the object of control, the process of formation and use thereof. It should be noted that the use of the same tools in different circumstances will affect the efficiency of their use in different ways. For example, in the case when there takes place the formation of a management object (human capital formation) it is to use the natural economic, legal and other methods. However, when human capital is already formed and is being implemented in the labour market, direct methods may be less effective, and priority should be given to the indirect management tools. Therefore, it becomes necessary to take into account the stages of formation and use of human capital (total and specific one), objectives and methods of management at each stage.

1.4. Overview of Empirical Studies Dedicated to the Effect of Intellectual Capital on Company Activity Results

The quantitative studies of interrelation between intellectual capital, including the human capital, and the company activity results allow empirical substantiation of its growing role under conditions of new economy for both company itself and its investors.

The difficulties of building the empirical models of intellectual capital effect on the company activity results are first of all associated with its special properties that must be taken into account in development of hypotheses, selection of analytical methods and interpretation of results received. The main characteristics of the intellectual capital are[1]:

- Non-exclusiveness and non-competitiveness leading to generation of multidirectional results in course of intellectual capital utilization;
- Inseparability from the host (in case of human capital);
- Subjectivity, which means than value of knowledge strongly depends on context of their use;
- Intangibility making the identification of intellectual capital components more difficult;

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[1] Tseng C.-Y., Goo Y.-J. J. Intellectual Capital and Corporate Value in an Emerging Economy: Empirical Study of Taiwanese Manufacturers // R&D Management. 2005. Vol. 35. N 2.P. 187–199.

- Effect of nonzero sum, where the amount of company's expenditures on generation and/or use of intellectual asset is not equal to its market value;

- Impotence of addition: when gaining the knowledge we already have, we do not acquire anything; besides that, the value of two or more competing intellectual assets belonging to the same person cannot be greater than the value of the best one.

At the beginning of XXI century a lot of studies dedicated to the identification of common trends and objective laws of intellectual capital effect on the company activity results were conducted. The pool of such empiric studies for the last ten years covers almost all geographic zones. Such studies are quite different by the sample, period of time, approaches used to measure the intellectual capital and methods of data collection and processing applied (table 4).

Table 4. The main empirical study of the influence of intellectual capital on company's performance

Authors	Methods for measuring of intellectual capital	Database	Main results
1	2	3	4
[Pulic, 2000b]	Value added intellectual coefficient (VAIC ™)	30 randomly selected companies from the stock exchange FTSE, 1992-1999.	There was a positive correlation between the level of Intellectual capital and the market value of the company
[Bontis, Keow, Richardson, 2000]	Allocation of the components of IC, Likert scale.	107 companies from Malaysia	There is a significant and positive relationship between IC and performance. The impact of individual components of IC on performance depends from industry.
[Kremp, Mairesse, 2002]	Allocation of IC components, evaluation of knowledge management	More than 5 thousand French companies, 1998-2000.	With increasing of knowledge management by 1% a innovations has increased by 4% and productivity - by 3%

[Foray, Gault, 2003]	VAIC™	75 public companies in South Africa with high level of IC	Extremely weak positive effect of IC on company performance in developing countries.
[Tseng, Goo, 2005]	A combination of methods: Tobin'sQ, VAIC™,MarkettoBook Value.	81 public companies in Taiwan	Complementary effect of individual IC components to the corporate value of the company was proved empirically. For high-tech companies impact of IC is positive and more pronounced than for Other sectors
[Chen, Cheng, Hwang, 2005]	VAIC™, Likert scale.	4254 public companies in Taiwan	Return on assets (ROA) is positively influenced by IC, R&D and advertising expenditures.
[Huang, Liu, 2005]	Allocation of components of the IC	297 public companies in Taiwan	A non-linear dependence of the return on assets of innovative capital
[Shiu, 2006]	VAIC™	80 public companies in Taiwan	IC level is positively related to ROA.
[Popov Vlasov, 2006]	Allocation of components of the IC	About 100 companies in Russia	A positive impact of investments into production of new knowledge for the profitability of the enterprise was found.
[Garanina, 2008]	Calculated intangible value (CIV)	43 companies in Russia	Market value is determined by the cost of material and intangible assets. Influence of tangible assets is expressed stronger

[Bayburina, Golovko, 2008]	Allocation of components of the IC.	19public companies in Russia	There was a positive relationship between intellectual added value and return on assets.
[Tan, Plowman, Hancock, 2007]	VAIC™	150 companies in Singapore	There was shown that the degree of positive impact of IC on company performance depends on the industry in which the company operates
[Chan, 2009]	VAIC™	About 100 companies in Hong Kong	In developing markets was not found significant effect of IC on the company performance. Investors are finding the role of physical capital higher than the IC
[Laing,Dunn, Hughes-Lucas,2010]	VAIC™	Hotels in Australia	The positive effect of IC on company performance
[Salamudin etal., 2010]	Model of the net assets and profit	2121 companies from Malaysia	The results indicate that the role of intangibles increases with creating the company's value
[Ayvazian Afanasiev, 2011]	Integral assessment of IC and its components with the help of statistical data, evaluation of intangible assets, goodwillqTobina, statistical hypothesis testing regarding the possibility of using these parameters in the model of production.	1000 companies in the USA in the sector of IT and Biotechnology and pharmaceuticals	For the assessments of the effectiveness of intellectual capital can be used ROA and qTobina. In this case, the use of these parameters requires a justification for the particular industry.

Source: Table drawn by the author.

Analysis of different studies allows identification of number of common hypotheses verified and confirmed in the most studies following the results of econometric analysis of data received:

- There is a positive relation between the level of intellectual capital and company activity results;
- On the developed markets effect of intellectual capital on the company activity results is expressed more prominently than on the developing markets.

As can be seen from Appendix 1, geography of the studies covers both developed and developing markets. Analysis of Russian studies shows, that the method mainly used for modeling the intellectual capital effect on the company activity results is identification of components with their characterization through qualitative indices under company accounting records. Thus, in the study by Garanina (10), the human capital is represented through labor remuneration fund, market capital – through revenue and organizational capital – through relation of costs to the number of company employees.

In the diploma project the study of human capital effect on company activity results consists of the following stages:

1) Developing hypotheses on human capital affecting the profit (hypothesis 1) and being a factor of company production (hypothesis 2);
2) Selection of variables (activity results indices);
3) Selection of human capital measurement method;
4) Testing hypotheses using the statistical packages;
5) Analysis of results received.

1.5. Human capital in the strategic management

Human resource management has, as one of its central tenets, the assumption that employees are the single most important asset of the organization[1]. This statements emphasize that workforce is the key factor of corporate success. However, for implementing possible competitive advantage through human capital it is necessarily to evaluate it. The calculation of human capital is a foundation of managerial optimization of an existing human resources and may be interpret as the main challenge for Human Capital Management (HCM).

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[1] George Boyne, Glenville Jenkins. Human resource management in the public and private sectors: an empirical comparison.
http://hum.ttu.ee/failid/oppematerjalid/Teadust%20alused/Boyne%20et%20al%20public%20vs%20private%20HRM.pdf

This evaluation create a problem for strategic management research; analysis and explanation of competitive advantages. In the strategic management are broadly use Resource Based View and Market Based View to define and highlight key success factors:

1) The Resource Based View focusing in internal strategic resources, which including not employees skills (intellectual, physical, motivational, social) and characteristics.

The RBV is based on two vital factors of the position of the firm within its market:

1. Heterogeneity imply that companies in the industry have a different amount of strategic resources.

2. Imperfect mobility of resources is the main factor for resource heterogeneity – imply that strategic resources cannot be traded and transferred between companies.[1]

When a firm apply a value creating strategy which is not concurrently applied by competitors, then the company have a competitive advantage. The competitive advantage can be continual if the competitors cannot imitate the benefits of the companies' strategy (Barney 1991, 102). In order to calculate a specific resource's potential which should be the source of a continual competitive advantage, Barney (1991, 105-112) defined four resource attributes that can be interpret as empirical indicators:

- The resource must be valuable (helping the company to implement strategies for the taking advantage with the help of opportunities and/or the liquidation of threats.

- The resource must be extraordinary (not available for the large amount of competitors).

- The resource must be imperfectly imitable (competitors not possessing the resource cannot copy it too easily). This can be achieved with the barriers to imitation.

- The resource must be imperfectly substitutable (for the resource there must be no strategically equivalent resource).

Looking at a firm as a collection of resources inspired many scholars to introduce their own definitions for the term "(strategic) resource" and respective resource classifications. The resulting spectrum of existing definitions thus has become more and more manifold, inconsistent and even controversial. This entails the obvious risk that the RBV might lose its power as a concept for the explanation of sustainable competitive advantages in strategic management theory. Following the premise above of firms disposing of idiosyncratic, immobile firm resources, it is indispensable to differentiate between "inputs" and

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[1] Jg., Heft, German Journal of Human Resource Research, Vol. 21, Issue 3, 2007.

"resources": In this sense, for the RBV a "resource" is compulsorily characterized by the attributes introduced above constituting heterogeneity in an industry, thus explaining the possible achievement of a sustainable competitive advantage value, scarcity, imperfect imitability, and imperfect substitutability.

Beyond this, in a much broader sense, all other imaginable (material and immaterial) "input factors" are homogeneous, marketable and hence not relevant for the achievement of a sustainable competitive advantage. This clarification is nonetheless still in line with all standard resource classifications since they all explicitly consider 212 Roman Bechtel: Calculating Human Capital: The Market Based Valuation of the Human Resource material as well as immaterial factors and they all consider the human resource as one central source of advantage.[1]

2) The Market Based View focusing on a firm's external environment, thus including different stakeholders and market obligations in the special business. I this case human capital should calculated with the help of the firm's personnel which is always refer to market performance of the company (value added calculations, market capitalizations, outputs, yields, revenues, earnings, profits, or returns).

State-of-the-art management theory is almost consistently characterized by an exclusive focus on the selling market side. The market for outputs – with products and customers – then usually forms the basis for any human capital calculation: either using extrapolations of historical market performance measures or – which is prevailing – using subjective projections of future expectancy values (based on estimated probabilities). The calculation of human capital then is a retrograde procedure: market performance measures, e.g., cash flows, resulting from human resource endowment and employment in the production process are discounted to present value. In this sense, the value of the human resource is calculated on the basis of the more or less successful employment of strategic resources, including the human resource, which is reflected in market performance, i.e. in created outputs and generated rents. This approach follows the hypothesis that a firm's human capital is strongly correlated to its market performance and resulting market valuations. Thus, market profitability becomes an indicator for human capital.[2]

Human capital planning is the method by which a company creates a framework of policies and programs in the terms of human capital to achieve a strategic plan.

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[1] Bechtel, Roman (2007) : Calculating human capital: The market based valuation of the human resource, Zeitschrift für Personalforschung (ZfP), ISSN 1862-0000, Rainer Hampp Verlag, Mering, Vol. 21, Iss. 3, pp. 206-231.
[2] Bechtel, Roman (2007) : Calculating human capital: The market based valuation of the human resource, Zeitschrift für Personalforschung (ZfP), ISSN 1862-0000, Rainer Hampp Verlag, Mering, Vol. 21, Iss. 3, pp. 206-231.

Implementation of the strategic human capital plan is a main step in a company progress to create an effective, performance-based organization by hiring, motivating, and rewarding quality employees. The strategic plan is the roadmap for improvement and the conceptual framework for rebuilding the culture within the company.

The strategic human capital's structure, content, and framework is different for each company, there are several common aspects that should be the part of strategic human capital plan. The plan should contain those elements (figure 2).

Figure 2. Key Components of a Strategic Human Capital Plan
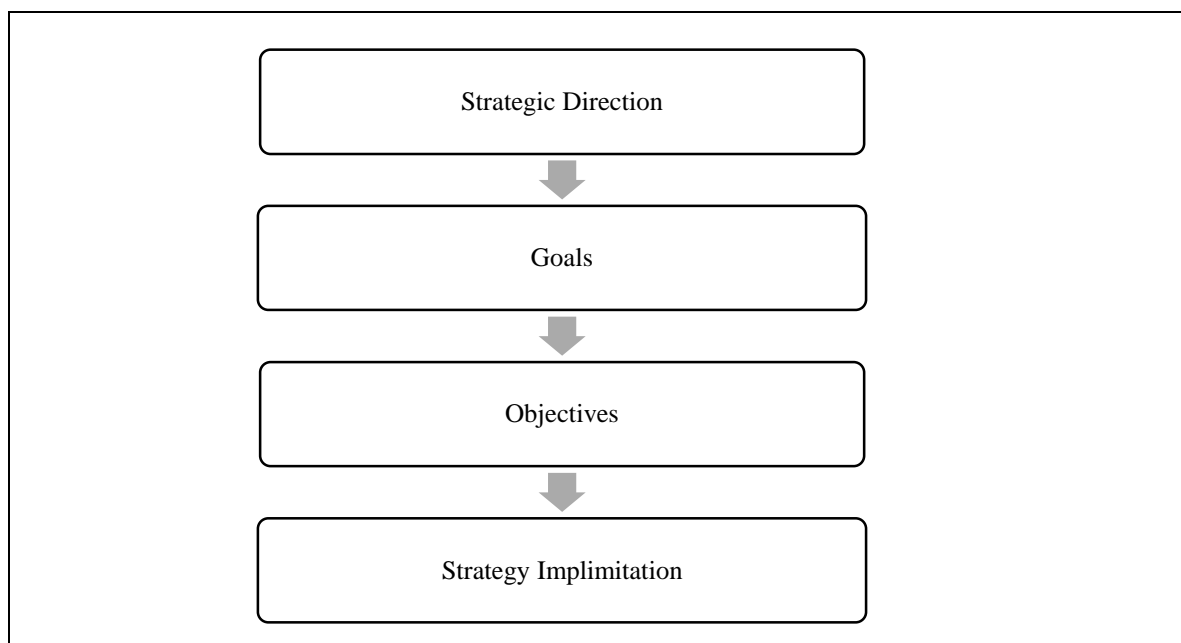
1) A clearly understood strategic direction:

This aspect requires a knowing of the organizations strategic plans, budgeting, internal and external factors affecting human capital and customer and stakeholder needs related to human resources. This step begins with the collection and analysis of the information. Data should also collected from customers and stakeholders about their requirements. During this step, it is important to create a future vision of the company's human resources to achieve its strategic superiority.

2) Customer and stakeholder human capital management outcomes/goals

The strategic direction helps define common human capital goals. These goals should be categorized within general human capital structures, for example:

• Effective use of resources (for example: Attract high-productive employees with the technical and professional skills)

• Performance (for example: Developing workforce's technical and professional skills)

• Leadership (for example: Effective Allocation of human resources across organizational components).

3) Strategies/objectives for accomplishing the goals

The objectives describe more precisely how the goals will be achieved. During strategy creation, it is important take into account the full range of human capital actions. For example,

Goal:

• Attract high-productive employees with the technical and professional skills.

Objectives:

• Develop long-term plans for the quality and quantity of employees needed;

• Create a flexible hiring process that delegates to managers to make hiring as the part of long-term plans;

• Create and Implement processes for quickly rotation of workforces to functional sectors with high productivity.

4) An implementation plan

The implementation plan identify the actions and process required for implementing the strategies or achieving the objectives. Implementation plans consist describe: the future activities; who is in charge; the resources needed (e.g.,financial,); deadlines.

5) An accountability system.

The accountability system describe how successful the company in implementing the strategy. Measures give the direction to the company on what it need to achieve and give the opportunity to test its progress.

Chapter 2. Formation of evaluation method of human capital, appropriate for research objectives

2.1. Main approaches to the evaluation of human capital

There are different approaches to the evaluation of human capital - cost, income, expert and comparative. However, the method, allowing objectively, systematically and comprehensively evaluate all of its constituent elements, has not been developed up to date. Measurement of human capital is usually inaccurate, but the process of measurement itself is extremely important. Organizations are gradually realizing the important link between human capital and financial results of the company – the link, which is not able to be taken into account by the traditional accounting methods.

Companies realize that the link may appear, or may not appear in specific indexes or figures that express the value of human capital. But trying to quantify it, they can understand what is the contribution to the work of each employee, to what extent they are committed to their work, what they think about the company and what is the probability that they quit. Often in the process of evaluation of human capital companies obtain useful understanding of their organizations and gain important information to work on.

Such works as Luthy, 1998; Sveiby, 2002; Bontis, 2001; Petty, Guthrie, 2000; Andreessen, Thyssen, 2004 have been devoted to the issued of human capital evaluation. In addition, works by Russian authors, revealing the same problem, have appeared.[1] The objective of this study does not include a detailed analysis of all available approaches to human capital evaluation, so we have selected only one of the approaches for detailed analysis.

There are two generally recognized main approaches to human capital evaluation: cost and income (rental). The cost approach is based on the summation of total expenditure on education, vocational training of specialists and other costs of the society, usually referred to investments in human capital (health maintenance, job search and related information about wages, migration). The cost of human capital is determined by the result of the accumulation of net investments in human development as a future employee at all stages of his/her life cycle.

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[1] Kozyrev A.N,, Makarov V.L. 2003 Valuation of intangible assets and intellectual property. 2nd ed. Buhvalov A.V., Volkov D.L. 2005a. Study the relationship between fundamental value and market capitalization of the Russian companies: 26-44.

Income principle involves the assessment of income received by employees which reflect the return on the funds invested in appropriate educational and qualification level. The application of income approach to human capital evaluation implies, first of all, the use of capitalization of income generated from the use of this type of capital. It is the situation that reflects the accumulation of human capital by the current generation and the potential of its use in economic activity over the service of the employee.

Cost measurement of human capital of the above two methods is based on a system of market prices and wages, which allows reproducing all the humanity. This information, through the spectacle of statistics, is sufficiently objective and reflects the trends in the regional and global labor markets, but it still cannot fully identify qualitative features of human capital.

All methods of "human capital" evaluation grow out of the unified need for measurement and control. The complexity of development of such methods certainly consists in the complexity of the measurement object.

2.2. Human capital evaluation on the basis of the company's profits

Human capital evaluation of the company contributes to the solution of the following tasks:

- obtaining the fair value of the company;
- monitoring of personnel in order to obtain timely information on the functional status of each employee, his/her potential, level of mastering the necessary competencies by them, as well as on the state of the team and forecast of the success of its operation;
- diagnosis of problem areas in the organization of the business process and development of measures to eliminate them;
- development of competency models, appropriate for business tasks of the company;
- adjustment of directions and forms to carry out the activity of the enterprise on acquisition, maintenance and use of human capital;
- development of programs for the development of the human capital of the enterprise as a whole and each employee individually.

Management of evaluation activities is carried out using the following functions: planning and design of measures, and evaluation procedures; organization of permanent and temporary

(design and expert) evaluation structures; motivation of evaluation procedures; performing control of evaluation activities.

The evaluation system of the human capital of the enterprise the evaluation procedures in the organizational structure are performed by: HR Manager; accountant-economist; heads of departments; a psychologist who may be included in the organizational structure as an independent staff element or in the department of staff training and development; assessors, who are united in the expert groups; it is recommended to use self-appraisal.

The evaluation methodology of human capital on the basis of the company's profits may be based on the following research methods:

- system analysis, providing disclosure of the evaluation system as a whole and its constituent elements, as well as identifying of ties of these elements together;
- method of evaluation of human capital on the basis of tests in the business environment, taking into account the results obtained by the employee (for example, the received profit).

The methods should provide the calculation of indicators, characterizing:

1. The value of human capital, such as the goodwill of human capital, including the profit indexes, the cost of human capital, job prospects, etc.

2. Quality (level) and effectiveness of human capital, i.e., compliance with the current level of human capital development, adopted as a standard, for example, the quality of professional human capital.

3. The cost of human capital, i.e., its value for the owner, buyer and consumer, expressed in cost units.

Methods are implemented through the assessment procedures carried out based on a particular technology, which is divided into:

- technology of work with information, using as technical means the computing tools, distributed networks and related software;
- Technology of organization of the activity of the participants of evaluation, formalized in the organizational documents.

In addition to the above, this methodology for evaluation of human capital should ensure the compliance with the following requirements: optimal set of elements for evaluation, objectivity, reliability, affordability, ease of technique.

In order to fulfill these requirements, the technology of evaluation of human capital uses the following principles:

- cost effectiveness - suggests the most efficient and cost effective organization of human capital evaluation system;

- complexity - takes into account all the factors affecting the evaluation system;

- reliability - requires explicit evaluation criteria;

- transparency - supplies the maximum objective evaluation methods;

- information support of the evaluation process – makes it possible to avoid misrepresentation of information, thus ensuring the reliability and objectivity of evaluation.

As a prerequisite for the development of human capital evaluation system is to automate the storage, processing and presentation of the records using computer equipment and specialized software, it seems appropriate to use appropriate information systems for organization of human capital evaluation, including:

- common database to all users;

- single information electronic space;

- software for data processing, calculation of indicators and reporting (MSExcel and MSAccess).

Development of such a system will allow for a comprehensive evaluation of human capital, and the combination of qualitative and quantitative methods of evaluation will ensure its objectivity.

To evaluate the human capital at first we will consider a methodology for intangible assets evaluation.

As a general approach to the evaluation of intangible assets used in this study the method of calculated intangible value, proposed by T. Stewart, was developed (*calculated intangible value — CIV*)[1]. The basis of this method is that the intangible value of the company is defined as the difference between the value of the company, determined in turn by the balance value of all company's assets and discounted flow of residual operating income, and the value of existing tangible assets, determined by the balance value of these assets and the discounted flow of residual income, obtained under the industry average rate of return. This difference characterizes the company's ability to use the intangible assets in order to "beat" the competitors in their own industry. The increasing importance of intangible value indicates the company's ability to generate profits in the future. The decreasing importance of

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[1]Stewart T. 1995. Trying to grasp the intangible. Fortune Magazine: 52–69.

intangible value indicates that the company's investments in intangible assets are not justified or that the company is investing too much money in tangible assets.

The main problems that may be faced with using this method are as follows:

- as a basic criterion in the method the profitability index of assets has been selected. However, it may be either too high, or too low, or even negative some companies.

- it is quite difficult to determine the index of weighted-average costs on capital, required to use the method.

- calculated intangible value is an aggregated index, which does not allow allocating the value of the individual components of intangible assets.

The calculation of the value of human capital in accordance with the selected method of assessment (*CIV*) is based on the model of the residual operating income (*residual operating income — REOI*) as a variant of the model of the fundamental value of equity capital. The residual income model, theoretical work on the subject, practical application of the model, review of fundamental works and modern publications are presented in Volkov, 2006б, 2005а, 2005б, 2004а; 2004б; Bukhvalov, Volkov, 2005а, 2005б; Volkov, Berezinets, 2006а, 2006б.

Furthermore, A.V. Bukhvalov and L.D. Volkov have conducted a study of Russian companies in terms of testing the hypothesis that "the size of the balance value of equity and residual net income can explain the value of companies' capitalization".

In recent decades, an increasing number of works devoted to the subject of the resource concept, emphasizing the role of the unique assets of the company, which "shifts the task of company's evaluation to the evaluation of its intangible assets", which indicates the relevance of the study subject[1].

As it has been mentioned above, the basis of evaluation in this work is a model of the residual operating income (*residual operating income — REOI):*

$$V_E^{REOI_j} = E_0^{BV} + \sum_{j=1}^{\infty} \frac{REOI_j}{(1+k_w)} = \left[NA_0^{BV} + \sum_{j=1}^{\infty} \frac{REOI_j}{(1+k_w)^j} \right] - D_0, \qquad (1)$$

Where, $V_E^{REOI_j}$ – Fundamental value of equity with the help of residual operating income model;

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[1]Ayvazyan S.A. Afanasiev M.Y. Methodology for assessing the human capital / Working Paper # WP / 2012/291. - CEMI, 2012. - 56 p.

	–	Book value at the time of evaluation of equity, net assets and debt, respectively;

E_0^{BV}, NA_0^{BV}, D_0

$REOI_j$ –   The residual operating income (the amount of money remaining after all operating expenses,

interest, taxes, preferred stock dividends (but not common stock dividends, plus this income is the earning that is above the minimum target return. This means that a residual income is the excess income earned on the return on investment.) Have been deducted from a company's total revenue) in j year. We can also use EVA (Economic Value Add)

k_W –   Weighted Average Cost of Capital ($WACC$).

The value in brackets in the formula (1) is a fundamental value of the assets on the model of the residual operating income (V_E):

$$V_E^{REOI_j} = NA_0^{BV} + \sum_{j=1}^{\infty} \frac{REOI_j}{(1+k_w)^j} \tag{2}$$

At the same time the residual operating income equals net operating income less the costs on investment capital:

$$REOI_j = NOPAT_j - k_w \times NA_{j-1}^{BV}, \tag{3}$$

Where, $NOPAT$ –   Net Operating Profit After Tax. We can calculate it using the formula below.

$$NOPAT = NI + I \times (1 - t), \tag{4}$$

NI –   Net Income;

I –   Interest;

$$T \qquad - \qquad \text{The income tax rate on the profit and loss account.}$$

If in the expression (2) with respect to the value *REOI* we suggest that this value is expected to be constant through an infinite interval of observation ($REOI = const$)[1], then the model (2) can be provided as:

$$V_E^{REOI} = NA_0^{BV} + \frac{REOI}{k_w} \tag{5}$$

Let's resolve the net assets in the balance sheet value into two components: tangible (NA_T) and intangible assets (NA_I). Superscript **BV** means that assets are taken within their balance sheet value:

$$NA^{BV} = NA_T^{BV} + NA_I^{BV} \tag{6}$$

Let's suppose further that the intangible assets generally are not reflected in the balance sheet, or that the proportion of their balance value with respect to tangible assets is so small that it can be neglected. Then, the expression (5) is converted to the following:

$$NA^{BV} = NA_T^{BV} \tag{7}$$

Accepting the assumption (7) the model (5) is converted into:

$$V_E^{REOI} = NA_T^{BV} + \frac{REOI}{k_w} \tag{8}$$

Thus, the residual operating income (*REOI*) characterizes the effect obtained by the organization from the use of both tangible and intangible assets. The main problem is the division of the general effect into the factors, its components. To resolve this issue let's suggest the following prerequisites of the study:

• companies, belonging to the same industry, are characterized by approximately the same structure of assets. It is possible to assume that one monetary unit invested in tangible assets, should provide all the companies of industry with the same return.

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[1]This assumption corresponds to the assumption of linear information dynamics (*LID*). Linear information dynamics is defined as a linear stochastic process expressing the change in time and the relationship between accounting and non-accounting information variables. *LID* predicts future expected values of residual income based on the actual values of accounting variables and other information in the present. More options of evaluation models for different *LID* modifications are considered in [Volkov, 2006; Volkov, Berezinets, 2006а, 2006б].

- intra-industry differences in profitability of the companies are explained by entirely unique intangible assets of each company.
- If we accept these prerequisites, this means that:
- profitability of tangible assets is the same for all companies in the industry, and equals the industry average profitability;
- profitability of intangible assets is the difference between the actual profitability and the company's industry average profitability. In this sense, the effects of the impact of intangible assets on total profitability can be both positive (in case of exceeding the company's profitability over the industry average one) and negative (otherwise).
- From the above-mentioned assumptions, we can make two principal conclusions:
- fundamental value of a company's tangible assets can be either positive or zero (if the industry average profitability is greater than or equal to zero);
- fundamental value of intangible assets may be both positive and negative if the industry average profitability is negative.

Accepting the above-mentioned assumptions, let's highlight the effects in the residual operating income, caused by tangible and intangible assets. To do this, we will carry out the following conversion of the expression (3) based on the assumption (7):

$$REOI = NOPAT - k_w \times NA_T^{BV} \pm RONA_{IAVG} \times NA_T^{BV} \qquad (9)$$

Where, $RONA_{IAVG}$ –   industry average return on net assets.

As a result,:

$$REOI = [NOPAT - RONA_{IAVG} \times NA_T^{BV}] + [RONA_{IAVG} \times NA_T^{BV} - k_w \times NA_T^{BV}] \; (10)$$

Taking into consideration (5), the expression (11) can be rewritten as follows:

$$REOI = [NA_T^{BV} \times (RONA - RONA_{IAVG})] + [NA_T^{BV} \times (RONA_{IAVG} - k_w)] \qquad (11)$$

The expression in the first square bracket of the formula (11) can be interpreted as the residual operating income, generated by intangible assets ($REOI_I$); the expression in the second square bracket can be interpreted as the residual operating income, generated by tangible assets ($REOI_T$):

$$REOI_I = NA_T^{BV} \times (RONA - RONA_{IAVG}) \qquad (12)$$

$$REOI_T = NA_T^{BV} \times (RONA_{IAVG} - k_w) \tag{13}$$

The formula of the fundamental value of assets (5), taking into account (12) and (13) can be represented as:

$$V_A^{REOI} = NA_T^{BV} + \frac{REOI}{k_w} = \left[NA_T^{BV} + \frac{REOI_T}{k_w}\right] + \left[\frac{REOI_I}{k_w}\right] = V_T + V_I \tag{14}$$

where the fundamental value of the company's assets is broken into the fundamental value of tangible (V_T) and intangible assets (V_I) as follows:

$$V_T^{REOI} = NA_T^{BV} + \frac{NA_T^{BV} \times (RONA_{IAVG} - k_w)}{k_w} = NA_T^{BV} \times \left(1 + \frac{RONA_{IAVG} - k_w}{k_w}\right) = NA_T^{BV} \times \frac{RONA_{IAVG}}{k_w} \tag{15}$$

$$V_I^{REOI} = \frac{RONA_I}{k_w} = NA_T^{BV} \times \frac{RONA - RONA_{IAVG}}{k_w} \tag{16}$$

Based on the evaluation of intangible assets, let's work out a formula for evaluation of the company's human capital. Let's add intangible and tangible assets, as well as salary to the formula.

$(RONA(ROA) - RONA_{IAVG}(ROA_{IAVG}))$ is the excess over the average profitability of net assets, within $RONA_{IAVG}$ profitability is generated by means of standard physical capital, so it turns out that this difference is a manifestation of human capital in the company's revenues.

One of the aims of my work is to learn which indicator RONA or ROA is better to be used.

Substituting (TA + IA) in the numerator of the formula, we obtain the value of income itself, received from the use of human capital.

$$VHC = HCRC \times \frac{(TA+IA)(RO - RO_{IAVG})}{(k_A \times IA + HCRC)} \tag{17}$$

Where, $HCRC$ – The cost of human capital in the current period;

TA – Tangible assets;

IA – Intangible assets;

k_A – The weighted average cost of capital ;

VHC – The value of human capital;

RO – Return on assets (ROA или RONA)

2.3. Description of basic data

The test of hypothesis that human capital is a productive resource and a factor of capitalization was carried out on a sample of annual financial statements (accounting statements, profit and loss statement, cash flow statement) of the largest companies in the world of IT-industry.

In order to identify the areas of the most fastest growing and capitalized companies and industries against the backdrop of current global trends in the concentration of capital the data of the rating of the largest companies in the world in terms of volume of market capitalization held by Financial Times (FT) were used. Resources shares in the portfolios of investors in 2012 were replaced by technology ones: total capitalization of the companies from the list of FT 500, referring to the sector of software and IT-services, exceeded the total capitalization of mining companies: USD 1.14 trn. compared to USD 820.2 bln. In 2011 the mining sector held the 5th place in the list of industries with USD 1.07 trn. It is currently on the 8th place[1]. Companies of wide range of sectors from the current FT 500 list perfectly illustrate this trend. For example, Apple (USD 559 bln), holding the 3rd place last year, changed the long-term leader of the list - the oil and gas company Exxon Mobil (USD 408.8 bln).

Companies engaged in IT technology are high-tech and have a greater, compared with other industries, amount of intangible assets, and the data in the balance sheet line code "Intangible assets" are more comprehensive. The final volume of a sample included 10 companies:

1) Apple Inc. - American Corporation, a manufacturer of personal and tablet computers, music players, phones and software. Apple is one of the pioneers in the field of personal computers and advanced multi-tasking operating system with a graphical interface. Headquarters - in Cupertino, California.

2) Microsoft Corporation - one of the largest multinational companies in the production of proprietary software for all kinds of computers - personal computers, game consoles, PDAs, mobile phones and other things. Microsoft Corporation is also the developer of the most widely used software platform - Windows.

3) Google Inc. - American multinational public corporation which investing in the Internet search, cloud computing, and advertising technologies. Google maintains

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[1]www.vedomosti.ru

and develops a number of Internet services and products and has a profit primarily from advertising through AdWords

4) International Business Machines Corporation (IBM) - American company with the headquarters in Armonk (New York), one of the world's largest manufacturers and suppliers of hardware, software, IT and consulting services.

5) Adobe Systems Incorporated - US-based software developer. The company is a leading manufacturer of software for graphic design and Web with annual revenues approaching $ 4 billion. Headquartered in San Jose (CA).

6) Hewlett-Packard Company - a large American company in the field of Information Technology, a provider of hardware and software for organizations and individual consumers. The company producing a range of printers, scanners, copiers, calculators, smartphones, servers and computers for office and home, workstations, network equipment, and also provides business services in IT. The company's headquarters is located in Palo Alto (California, USA).

7) Dell, Inc. – American corporation designs, manufactures, sells and services a wide range of models of personal computers (desktops, laptops, PDAs), tablet PCs, servers, storage (SAN, NAS), network equipment, computer peripherals (monitors, printers, video cameras), MP3 -player, high-definition TVs, and various consumer electronics products made by other manufacturers and software. Headquartered in Round Rock, Texas, in the United States.

8) Systems, Applications & Products in Data Processing (SAP SE) - German company, a manufacturer of software for organizations. The company developing automated control systems of the enterprise's internal processes such as: accounting, trade, production, finance, personnel management, warehouse management, and so on. Headquartered in Walldorf.

9) EMC Corporation - American company, one of the world's largest corporations on the market of products, services and solutions for information storage and management. The main activity is developing and producing storage systems and software for the management of information infrastructures. Headquarters - in the city of Hopkinton, Massachusetts (USA).

Data for 2008-2014, presented on the company website in the public domain, were used for the calculation of the indicators.

In the graphs 3 - 5 main indicators was represent.

Figure 3. Total assets of IT companies.
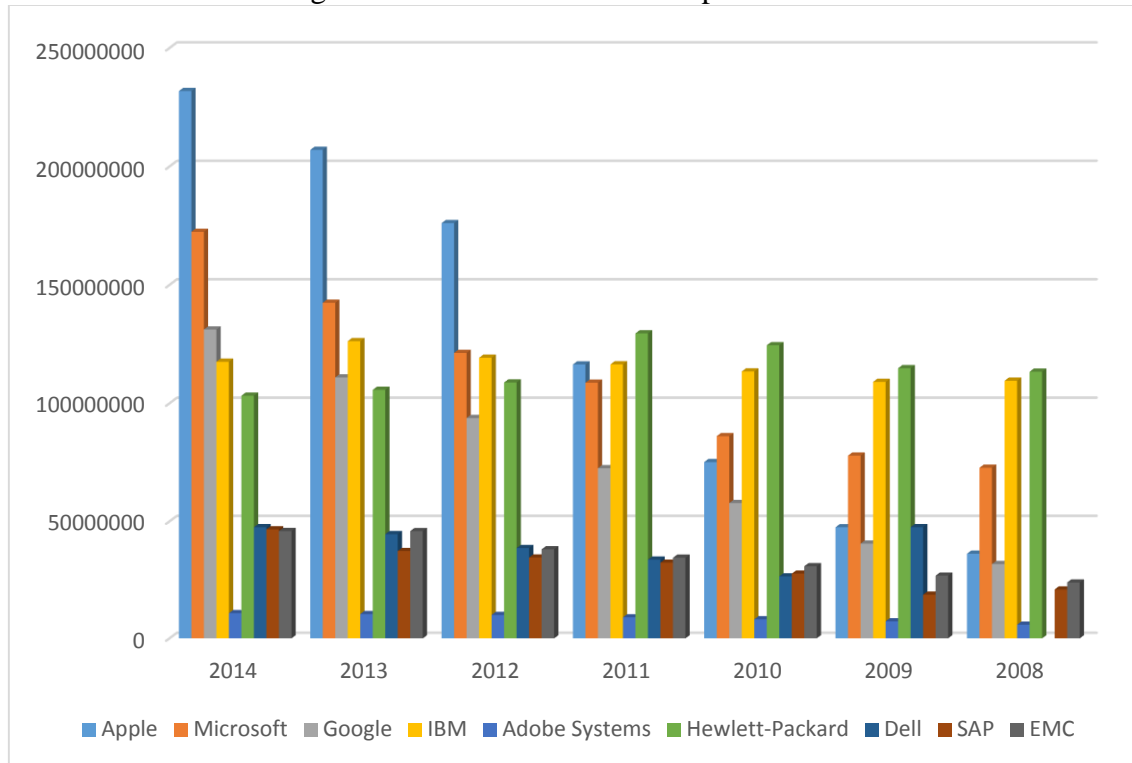
The item *"Total Assets" (TA)* is defined in the respective on-balance-sheet item and is the sum of all assets (tangible and intangible).

Figure 4. Capitalization of IT companies.
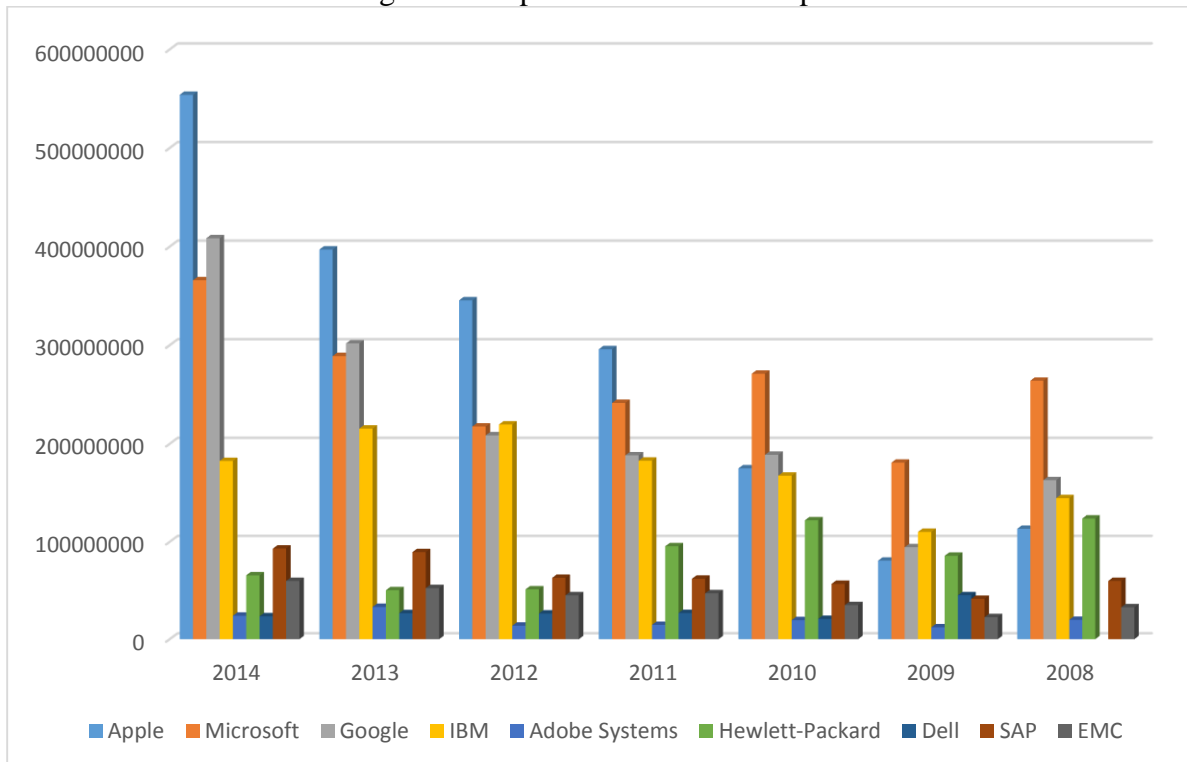
The value "*Capitalization*" *(CAP)* corresponds to the market value of the company.

Figure 5. Revenue of IT companies.
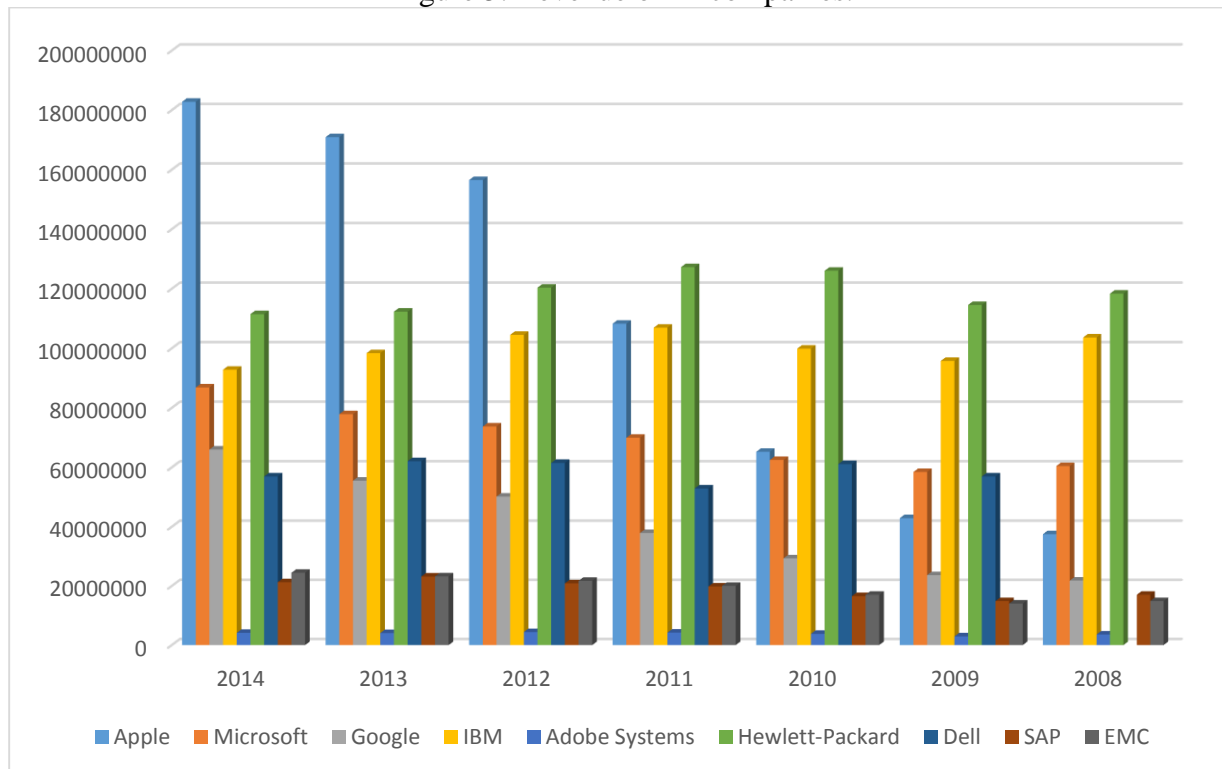
As an indicator of the company's revenue (R) the item Revenue from Income Statement of the company, equal to the total annual income of the company, was used.

The value "*Tangible assets*" (TA) is defined by the item *Tangible assets* from the balance sheet of the company. The value "Intangible assets" (IA) is defined by the item "Intangible Assets" from the balance sheet of the company.

The item "*Fixed asset*" (FA) is defined in the respective on-balance-sheet item. The "Fixed asset" refers to the stocks, bonds or other assets that the investor plans to use for a long period of time, i.e. the assets with low liquidity.

The value "*Current Assets" (CA*) is defined in the respective on-balance-sheet item. "*Current Assets*" include cash, receivables, securities and other liquid assets that can easily be converted into cash. The value "*Current Liabilities*" (CL) is defined in the item "*Total Current Liabilities*" from the balance sheet of the company. It includes: operating costs (staff costs, rents) and regular payments (payment for support of the acquired information systems, payment for communications services, etc.).

The value "*Research*" is defined by the item "*Research*" from *Income Statement* of the company that includes R&D costs and the salary of the researchers.

As an indicator of the company's *Net income* the item *Net income* from *Income Statement* of the company, equal to the company's revenue prior to the payment of dividends, was used.

As an indicator of labor (L) the item "medium-term number of employees", equal to the number of employees of the company, was used.

The indicator WACC is a weighted average cost of capital, obtained from the site http://www.wikiwealth.com/

Since the payroll (Wage) is confidential information, this indicator was calculated by myself. The information on the average wage per employee in a certain company was used as a basic, and this value was multiplied by the number of employees in the company.

The value Return on assets (*ROA) was* calculated by the formula

$$ROA = \frac{NetIncome}{TotalAssets} \tag{18}$$

An indicator of how profitable a company is relative to its total assets. Return on assets gives an idea as to how efficient management is at using its assets to generate earnings.in other words it's tell us what earnings were generated from invested capital (assets)[1].

The value *RONA* was calculated on the basis of the company's assets deducting its current liabilities. The higher the return is, the better the profit indicators for the company are. Its difference from ROA is that we subtract current liabilities in the denominator of total assets.

$$RONA = \frac{NetIncome}{TotalAssets - CurrentLiabilities} \tag{19}$$

The return on net assets measures how efficiently a company is using its net assets its fixed assets and networking income) in order to make a profit. The higher the ratio is, the better the company's performance is thought to be[2].

The Annex 2 includes a summary table for the 9 companies of IT-industry with all of the above-mentioned indicators.

[1] http://www.investopedia.com/terms/r/returnonassets.asp
[2] http://financial-dictionary.thefreedictionary.com/RONA+(financial+ratio)

Chapter 3. The results of empirical research and recommendations (Based on IT-sector example)

3.1. The results of assess of the human capital impact on the company's capitalization.

The main hypotheses discussed in this research paper:

Hypothesis 1. The value VHC, which was calculated by the formula (20)

$$VHC = HCRC \times \frac{(TA+IA)(RO-RO_{IAVG})}{(k_A \times IA + HCRC)} \qquad (20)$$

Where,

$HCRC$	–	The value of the human capital in the current period (HCRC = Wage +R&D or HCRC =Goodwill)
TA	–	Tangible assets
IA	–	Intangible assets
k_A	–	The weighted average cost of capital
VHC	–	- Estimation of human capital (Goodwill or Research +Wage)
RO	–	Return on assets (ROA or RONA)

Can be used for the evaluation of the human capital in the simulation of the market capitalization along with other factors

Hypothesis 2. The value VHC, which was calculated by the formula (21)

$$VHC = HCRC \times \frac{(TA+IA)(RO-RO_{IAVG})}{(k_A \times IA + HCRC)} \qquad (21)$$

can be used for the evaluation of the human capital in the simulation of the economic growth of the company along with the basic factors of production.

The objective of this chapter is not only the above hypotheses to be verified, but also definition of the best set of indicators in the three-factor or four-factor models, as well as determining which indicator *«RONA»* or *«ROA»* and *«Goodwill»* or *«Wage +R&D»* s better to use to assess the human capital.

The relationship extent of the indicators of the use of the human capital and performance indicators of the company can be estimated based on the correlation matrix of their values. Table 5 shows the correlation matrix of indicators of human capital in the IT-sector companies.

Table 5. Correlation matrix of indicators

	ta	capita~n	revenue	vhcgr	vhchro	vhchr	vhcgro
ta	1.0000						
capitaliza~n	0.8544	1.0000					
revenue	0.8967	0.6583	1.0000				
vhcgr	0.7585	0.7785	0.7190	1.0000			
vhchro	0.7440	0.7524	0.7329	0.9915	1.0000		
vhchr	0.7878	0.7357	0.8135	0.9738	0.9685	1.0000	
vhcgro	0.7921	0.7436	0.7947	0.9609	0.9379	0.9901	1.0000

Source: Table computed by the author.

Where,

ta	Tangible assets
vhcgr	Value of Human Capital which was computed with the help of Goodwill and ROA
vhchro	Value of Human Capital which was computed with the help of Wage +R&D and RONA

vhchr	Value of Human Capital which was computed with the help of Wage +R&D and ROA
vhcgro	Value of Human Capital which was computed with the help of Goodwill and RONA

For IT- sector correlation coefficients of all indicators are high enough and have the correct sign. So, it does not prevent the use of these indices as estimates of human capital in the construction of models of the market value of the company and the model of productive capital.

Unlike correlation analysis the regression estimate allows not only to identify the direction and extent of the relationship of two variables, but also to form an aggregate model of the impact of various parameters on the value of the analysed indicator. It should be noted that, according to the tests been carried out the modelling of the company's profitability and production operations should be carried out properly, taking into account previous periods, since these indicators are determined not only by the current values of the efficiency of the use of different kinds of resources, but also depend on the companies' activity in the previous years.

To test the **Hypothesis 1,** let us consider a model which takes into account the dynamics of the economic process, as well as all factors of production, including physical assets, intangible assets and assessment of human capital.

In this paragraph the following econometric models are given.

Linear models of the human capital, intangible and tangible assets dependence of capitalization on human capital, intangable and tangible assets of the company:

Capitalization = C(1)+ C(2) (TA)+C(3)*(IA)+C(4)*VHCHR*
*Capitalization = C(1)+ C(2) * (Total Assets)+C(2)* VHCHR*
Where,

    VHCHR – Value of Human Capital (computed with help of (Research +Wage Fund) and ROA).

    *TA –*Tangible assets

    IA– Intangible assets

Capitalization = C(1)+ C(2) (TA)+C(3)*(IA)+C(4)* VHCGRO*

Capitalization = C(1)+ C(2)(Total Assets)+C(3)* VHCGRO*

Where,

 VHCGRO – Value of Human Capital (computed with help of Goodwill and RONA).

Capitalization = C(1)+ C(2) (TA)+C(3)*(IA)+C(4)* VHCHRO*

Capitalization = C(1)+ C(2) (Total Assets)+C(3)* VHCHRO*

Where,

 VHCHRO – Value of Human Capital (computed with help of (Research +Wage Fund) and RONA).

Capitalization = C(1)+ C(2) (TA)+C(3)*(IA)+C(4)* VHCGR*

Capitalization = C(1)+ C(2) (Total Assets)+C(3)* VHCGR*

Where,

 VHCGR – Value of Human Capital (computed with help of Goodwill and ROA).

Table 6-9 shows the results of estimating the regression dependence with different ways for estimating the *VHC* indicator presented *above*.

Table 6. Evaluation of the regression for the IT-sector with the help of VHCHR

(computed with help of (Research +Wage Fund) and ROA).

Source	SS	df	MS			Number of obs =	40
						F(3, 36) =	48.01
Model	4.9333e+17	3	1.6444e+17			Prob > F =	0.0000
Residual	1.2330e+17	36	3.4249e+15			R-squared =	0.8000
						Adj R-squared =	0.7834
Total	6.1663e+17	39	1.5811e+16			Root MSE =	5.9e+07

capitaliza~n	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ta	1.339807	.4714732	2.84	0.007	.383615	2.295999
ia	5.475029	7.636078	0.72	0.478	-10.01166	20.96171
vhchr	3.965923	1.931276	2.05	0.047	.0491137	7.882733
_cons	4662556	1.87e+07	0.25	0.804	-3.32e+07	4.25e+07

Source: Table computed by the autho

Table 7. Evaluation of the regression for the IT-sector with the help of *VHCGRO*

(computed with help of Goodwill and RONA).

Source	SS	df	MS		
Model	4.9683e+17	3	1.6561e+17		
Residual	1.1980e+17	36	3.3278e+15		
Total	6.1663e+17	39	1.5811e+16		

Number of obs = 40
F(3, 36) = 49.77
Prob > F = 0.0000
R-squared = 0.8057
Adj R-squared = 0.7895
Root MSE = 5.8e+07

capitaliza~n	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
ta	1.187563	.4855033	2.45	0.019	.2029166	2.172209
ia	7.489325	7.776238	0.96	0.342	-8.281617	23.26027
vhcgro	5.048014	2.174192	2.32	0.026	.6385492	9.45748
_cons	2272492	1.84e+07	0.12	0.902	-3.50e+07	3.96e+07

Source: Table computed by the author.

Table 8. Evaluation of the regression for the IT-sector with the help of *VHCHRO*

(computed with help of (Research +Wage Fund) and RONA).

Source	SS	df	MS		
Model	3.0856e+17	3	1.0285e+17		
Residual	8.7371e+16	26	3.3604e+15		
Total	3.9594e+17	29	1.3653e+16		

Number of obs = 30
F(3, 26) = 30.61
Prob > F = 0.0000
R-squared = 0.7793
Adj R-squared = 0.7539
Root MSE = 5.8e+07

capitaliza~n	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
ta	1.026853	.4548693	2.26	0.033	.0918561	1.961851
ia	11.95793	8.039806	1.49	0.149	-4.568124	28.48399
vhchro	6.072285	2.570742	2.36	0.026	.7880489	11.35652
_cons	3.27e+07	2.37e+07	1.38	0.179	-1.60e+07	8.13e+07

Source: Table computed by the author.

Table 9. Evaluation of the regression for the IT-sector with the help of *VHCGR*

(computed with help of Goodwill and ROA).

Source	SS	df	MS		Number of obs =	30
					F(3, 26) =	33.98
Model	3.1546e+17	3	1.0515e+17		Prob > F =	0.0000
Residual	8.0471e+16	26	3.0950e+15		R-squared =	0.7968
					Adj R-squared =	0.7733
Total	3.9594e+17	29	1.3653e+16		Root MSE =	5.6e+07

capitaliza~n	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ta	.8007474	.4595172	1.74	0.093	-.1438038	1.745299
ia	14.60141	7.911049	1.85	0.076	-1.659984	30.8628
vhcgr	8.533319	2.964261	2.88	0.008	2.440193	14.62644
_cons	3.02e+07	2.26e+07	1.34	0.193	-1.62e+07	7.66e+07

Source: Table computed by the author.

All the obtained coefficients were positive, which is means that if we will increase Human Capital value by one unit we will increase our capitalization by (3.96; 5.04; 6.07; 8.53). However, only for models with *VHCGR (computed with help of Good will and ROA)* all variables proved to be significant at the ten percent level.

If we talk about a model specification, all 4 models are almost indistinguishable. Constructed models are good *R2andAdjustR2* determinant factors. This figure shows how the capitalization is explained by other variables (in this case, the tangible assets and intangible assets, as well as human capital). In other words, *R-squared* shows the suitability of the constructed model for prediction. The lower is *R-squared,* the less is influence of the explanatory factors on the final variable. All the factors have right sign.

However, model with *VHCGRO* have bigger explanatory power (R2= 0.8057) then others. Coefficient of this model is 5.05, which is means that if we will increase Human Capital value by one unit we will increase our Capitalization by 5.05.

Now we can test the Hypothesis:

H0= There is no leaner relationship between Value of human capital and capitalization of the company

H1= There is linear relationship between Value of human capital and capitalization of the company

All P values (the probabilities that the null hypothesis is true) of human capital value in all econometrics models are very low (0.008, 0.026, 0.026, and 0.047) with the 5% confident interval we can reject H0. It is mean that there is a leaner relation between Value of human capital and capitalization of the company.

The main problem in this models that Intangible assets have a big P value (0,478; 0,342; 0,149) which is mean that we cannot reject that there is no leaner relationship between Intangible assets and capitalization of the company, which cannot be true. Therefore, the use of this set of indicators and regression dependence in the construction of the production potential model of IT-companies is inappropriate.

If instead Tangible assets and Intangible assets we will take just Total assets, we will receive these results, in the table 10 – 13.

Table 10. Evaluation of the regression for the IT-sector with the help of VHCHR
(computed with help of (Research +Wage Fund) and ROA) and Total Assets.

Source	SS	df	MS		Number of obs =	40
					F(2, 37) =	73.34
Model	4.9242e+17	2	2.4621e+17		Prob > F =	0.0000
Residual	1.2421e+17	37	3.3572e+15		R-squared =	0.7986
					Adj R-squared =	0.7877
Total	6.1663e+17	39	1.5811e+16		Root MSE =	5.8e+07

capitaliza~n	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
totalassets	1.527579	.2979284	5.13	0.000	.923919	2.13124
vhchr	3.344349	1.497019	2.23	0.032	.3110996	6.377598
_cons	6574537	1.81e+07	0.36	0.719	-3.01e+07	4.33e+07

Source: Table computed by the author.

Table 11. Evaluation of the regression for the IT-sector with the help of VHCGRO (computed with help of Goodwill and RONA) and Total Assets.

Source	SS	df	MS		Number of obs =	40
					F(2, 37) =	75.17
Model	4.9484e+17	2	2.4742e+17		Prob > F =	0.0000
Residual	1.2179e+17	37	3.2916e+15		R-squared =	0.8025
					Adj R-squared =	0.7918
Total	6.1663e+17	39	1.5811e+16		Root MSE =	5.7e+07

capitaliza~n	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
totalassets	1.483327	.2971794	4.99	0.000	.8811849	2.08547
vhcgro	3.949185	1.636022	2.41	0.021	.6342898	7.264081
_cons	5522018	1.78e+07	0.31	0.758	-3.06e+07	4.16e+07

Source: Table computed by the author.

Table 12. Evaluation of the regression for the IT-sector with the help of *VHCHRO (computed with help of (Research +Wage Fund) and RONA) and Total Assets*

Source	SS	df	MS		Number of obs =	30
					F(2, 27) =	43.91
Model	3.0284e+17	2	1.5142e+17		Prob > F =	0.0000
Residual	9.3098e+16	27	3.4481e+15		R-squared =	0.7649
					Adj R-squared =	0.7474
Total	3.9594e+17	29	1.3653e+16		Root MSE =	5.9e+07

capitaliza~n	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
totalassets	1.469097	.3075128	4.78	0.000	.8381326	2.100061
vhchro	4.476998	2.291084	1.95	0.061	-.2239177	9.177914
_cons	3.10e+07	2.39e+07	1.30	0.206	-1.81e+07	8.01e+07

Source: Table computed by the author.

Table 13. Evaluation of the regression for the IT-sector with the help of *VHCGR*
(computed with help of Goodwill and ROA).

Source	SS	df	MS			
Model	3.0681e+17	2	1.5341e+17			
Residual	8.9121e+16	27	3.3008e+15			
Total	3.9594e+17	29	1.3653e+16			

Number of obs = 30
F(2, 27) = 46.48
Prob > F = 0.0000
R-squared = 0.7749
Adj R-squared = 0.7582
Root MSE = 5.7e+07

capitaliza~n	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
totalassets	1.385387	.3078356	4.50	0.000	.7537606	2.017014
vhcgr	5.974644	2.621588	2.28	0.031	.5955897	11.3537
_cons	2.91e+07	2.33e+07	1.25	0.223	-1.88e+07	7.69e+07

Source: Table computed by the author.

If we talk about a model specification, all 4 models are almost indistinguishable. Constructed models are good *R2andAdjustR2* determinant factors. All the factors have right sign.

Now we can test the Hypothesis:

H0= There is no leaner relationship between Value of human capital and capitalization of the company

H1= There is leaner relationship between Value of human capital and capitalization of the company

All P values of human capital value in all econometrics models are very low (0.032, 0.021, 0.061, 0.031) with the 5% confident interval we can reject H1. It is mean that there is a leaner relation between Value of human capital and capitalization of the company. All P values of total assets are significant low (0).

All the obtained coefficients were positive, which is means that if we will increase Human Capital value by one unit we will increase our capitalization.

Therefore, the use of this set of indicators and a regression model in the construction of the company's capitalization model in the industry is appropriate. However, for models with *VHCGRO (computed with help of Good will and RONA)* P value is lower compare with others and R2 is higher.

Analysis of the data obtained indicates that the estimated regression relationship can be seen as a basis for constructing a model of the company's capitalization, and for the estimation of human capital it is better to take *VHCGRO (computed with help of Good will and ROA*) in the 3 factors model *and VHCGRO (computed with help of Good will and RONA)* in the 2 factors model.

3.2. The results of assess of the company's human capital impact on the company's economic growth.

The term 'growth' is used in ordinary discourse with twodifferent connotations. It sometimes denotes merelyincrease in amount; for example, when one speaks ofgrowth in output, export, and sales. At other times,however, it is used in its primary meaning implying anincrease in size or improvement in quality as a result of aprocess of development, akin to natural biologicalprocesses in which an interacting series of internalchanges leads to increases in size accompanied bychanges in the characteristics of the growing object.[1]

Economic growth is closely associated with the problems of expanded reproduction, in fact, economic growth is a concentrated expression and a way to solve the problems of reproduction.

Economic growth is a trend to change the aggregate indicators of the company's development over a certain period of time, usually per year. To characterize the economic growth both general and particular indicators are used.

The general index of the dynamics of economic growth is generally considered to be the growth in revenue, earnings and profitability over time. The labour productivity, production efficiency and so on are used as separate indicators.

The development and expansion of the company can be carried out in two types: extensive and intensive.

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[1] Penrose, E. and Pitelis, C. The theory of the growth of the firm. Oxford: Oxford University Press: 2009.

Extensive economic growth is all factors of production to be simply extended, as a rule, in the already existing proportions (ratios): tools, objects of labour and workers. For extensive growth the following is indicative: technical stagnation, preservation of the existing structure of production, its expensive nature and limited resources.

Intensive economic growth is based on the use of progressive (resource saving) equipment and technology, advance science, scientific, technical and economic information, the growth of skills of workers. As a result, it increases the efficiency of the company's activity, including increased labour productivity, resource conservation, product quality. Intensive economic growth overcomes the limits and constraints of extensive development.

Penrose's original contribution in 1959 shaped thedirection of growth. From a totally 'inside-out' perspective,firm's growth is now conceived as the endogenousoutcome of perennial intra-firm knowledge creation. Firm growth demands theability to master technologies, engender labor skill,organize the production process as well as efficientlyserve a market. A firm will exploit a growth opportunity aslong as the benefits outweigh the costs, given the level ofability with which the firm was endowed at start-up. According to Skrtand Antoncic, in order for the firm to grow, theentrepreneur needs to formulate an exact, clear missionand vision for his or her firm. Strategic planning can beconsidered important in driving firm growth.[1]

Classification of growth factors:

The internal factors affecting the economic growth of the company, include:

- the sectoral affiliation of a business entity;
- the structure of products (services) being produced, its share in the total effective demand;
- the amount of paid-up share capital;
- the amount of the costs, dynamics thereof compared with monetary income;
- the condition of the assets and financial resources, including reserves and resources, composition and structure thereof;
- the technical and technological level of production and innovation activity;
- the labour productivity and mode of saving;
- the competitiveness and quality of products;

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[1] Abu Hassan. Factors determining growth of companies: A study on construction companies in Malaysia. African Journal of Business Management Vol.5 (22), pp. 8753-8762,30 September, 2011

- the organizational structure and production management.

The impact of these factors depends largely on the competence and professionalism of the managers of the company, their ability to take into account changes in internal and external environment.

The external factors include:

- legal acts on control over the activities of the enterprise;

- political and economic stability;

- development of market infrastructure and market relations;

- scientific and technical progress and new technologies;

- the impact of competitors and consumers;

- commodity prices, tariffs, transport;

- financial and credit, tax, investment and protectionist policies in the country and the region.

Precisely formulating visions and strategy, incorporatingthe elements of internationalization and networking in thefirm vision, focusing on growth, profit, and market,performing analyses of market and competition,accurately formulating generic business strategies andachieving company wide support for strategies can all bebeneficial for the growth of smaller firms. Weinzimmer has concluded that many researchers haveexamined the influence of strategy factors on organi-zational growth; the relationship between characteristicsof top management and organizational growth; strategyand industry characteristics on organizational growth; andindustry and top management characteristics onorganizational growth. In his conclusion, three sets ofdeterminants had been identified; namely, industryattributes, organization strategies and top managementcharacteristics. Moreover, according to Schneider it has been suggested in the literature thatemployee development is especially important for start-up companies to achieve organizational performance andin particular high growth.[1]

In my paper I used the company's revenue as the main factor of economic growth.

To test the **hypothesis 2,** let us consider a model that takes into account the dynamics of the economic process, as well as all factors of production, including physical capital, number of employees, intangible assets and assessment of human capital. For this purpose regression charts presented given in tables 14 – 17 have been constructed.

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[1] Abu Hassan. Factors determining growth of companies: A study on construction companies in Malaysia.
African Journal of Business Management Vol.5 (22), pp. 8753-8762,30 September, 2011

Where,

 TA –Tangible assets

 IA– Intangible assets

 Employees – the number of employees

 VHCHR – Value of Human Capital (computed with help of (Research +Wage Fund) and ROA).

 VHCGRO – Value of Human Capital (computed with help of Goodwill and RONA).

 VHCHRO – Value of Human Capital (computed with help of (Research +Wage Fund) and RONA).

 VHCGR – Value of Human Capital (computed with help of Goodwill and ROA).

Models of the impact of human capital, tangible and intangible assets and number of employees to the company's revenue.

$$REVENUE=C(1)+C(2)*Employees +C(3)*TA+C(4)*IA+C(5)* VHCHR$$
$$REVENUE=C(1)+C(2)*Employees +C(3)*TA+C(4)*IA+C(5)* VHCGRO$$
$$REVENUE=C(1)+C(2)*Employees +C(3)*TA+C(4)*IA+C(5)* VHCHRO$$
$$REVENUE=C(1)+C(2)*Employees +C(3)*TA+C(4)*IA+C(5)* VHCGR$$

Models of the impact of human capital, total assets and number of employees to the company's revenue.

$$REVENUE=C(1)+C(2)*(Employees)+C(3)* (Total Assets)+C(4)* VHCHR$$
$$REVENUE=C(1)+C(2)*(Employees)+C(3)* (Total Assets)+C(4)* VHCGRO$$
$$REVENUE=C(1)+C(2)*(Employees)+C(3)* (Total Assets)+C(4)* VHCHRO$$
$$REVENUE=C(1)+C(2)*(Employees)+C(3)* (Total Assets)+C(4)* VHCGR$$

Table 14. Evaluation of the production potential regression with the help of VHCHR *(computed with help of (Research +Wage Fund) and ROA).*

Source	SS	df	MS			Number of obs =	40
						F(4, 35) =	46.98
Model	5.6312e+16	4	1.4078e+16			Prob > F =	0.0000
Residual	1.0487e+16	35	2.9963e+14			R-squared =	0.8430
						Adj R-squared =	0.8251
Total	6.6799e+16	39	1.7128e+15			Root MSE =	1.7e+07

revenue	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
employees	74.29504	22.97831	3.23	0.003	27.64658	120.9435
ta	.478934	.1525863	3.14	0.003	.1691673	.7887006
ia	-.0320367	2.280548	-0.01	0.989	-4.661796	4.597722
vhchr	.9567656	.6085168	1.57	0.125	-.2785892	2.19212
_cons	8351425	5632394	1.48	0.147	-3082943	1.98e+07

Source: Table computed by the author.

Table 15. Evaluation of the production potential regression with the help of *VHCGRO (computed with help of Goodwill and RONA).*

Source	SS	df	MS			Number of obs =	40
						F(4, 35) =	43.79
Model	5.5675e+16	4	1.3919e+16			Prob > F =	0.0000
Residual	1.1124e+16	35	3.1784e+14			R-squared =	0.8335
						Adj R-squared =	0.8144
Total	6.6799e+16	39	1.7128e+15			Root MSE =	1.8e+07

revenue	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
employees	65.52143	23.13273	2.83	0.008	18.5595	112.4834
ta	.6121669	.1600535	3.82	0.001	.287241	.9370929
ia	-1.321398	2.417128	-0.55	0.588	-6.228427	3.585632
vhcgro	.3992095	.699651	0.57	0.572	-1.021158	1.819577
_cons	8366394	5815790	1.44	0.159	-3440287	2.02e+07

Source: Table computed by the author.

Table 16. Evaluation of the production potential regression with the help of *VHCHRO* (computed with help of (Research +Wage Fund) and RONA).

Source	SS	df	MS			
Model	4.6277e+16	4	1.1569e+16			
Residual	5.4655e+15	25	2.1862e+14			
Total	5.1743e+16	29	1.7842e+15			

Number of obs = 30
$F(4, 25) = 52.92$
Prob > F = 0.0000
R-squared = 0.8944
Adj R-squared = 0.8775
Root MSE = 1.5e+07

revenue	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
employees	91.77098	23.5934	3.89	0.001	43.17945	140.3625
ta	.4904409	.1434377	3.42	0.002	.1950254	.7858565
ia	-1.838645	2.130268	-0.86	0.396	-6.226015	2.548725
vhchro	2.219137	.820979	2.70	0.012	.5282993	3.909975
_cons	297769.7	6107232	0.05	0.962	-1.23e+07	1.29e+07

Source: Table computed by the author.

Table 17. Evaluation of the production potential regression with the help of *VHCGR* (computed with help of Goodwill and ROA).

Source	SS	df	MS			
Model	4.5370e+16	4	1.1343e+16			
Residual	6.3721e+15	25	2.5488e+14			
Total	5.1743e+16	29	1.7842e+15			

Number of obs = 30
$F(4, 25) = 44.50$
Prob > F = 0.0000
R-squared = 0.8769
Adj R-squared = 0.8571
Root MSE = 1.6e+07

revenue	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
employees	79.42027	25.76592	3.08	0.005	26.35435	132.4862
ta	.5847063	.1654967	3.53	0.002	.2438595	.925553
ia	-2.575584	2.386942	-1.08	0.291	-7.491583	2.340415
vhcgr	1.773436	1.07723	1.65	0.112	-.4451609	3.992034
_cons	-520439.5	6609487	-0.08	0.938	-1.41e+07	1.31e+07

Source: Table computed by the author.

Constructed models have a high coefficient R2 (0.8430; 0.8335; 0.8944; 0.8769), which indicates their high predictive power.

H0= There is no leaner relationship between Value of human capital and Revenue of the company.

H1= There is leaner relationship between Value of human capital and Revenue of the company

For the model with VHCHRO P value of human capital value are low (0.012) with the 5% confident interval, we can reject H0. It is mean that there is a leaner relation between Value of human capital and capitalization of the company.

For other the models P values of human capital is high. It is mean that we cannot reject there H0 (There is no leaner relationship between Value of human capital and Revenue of the company)

However, intangible assets turned out to have negative sign in all models besides many indicators are not significant. Therefore, the use of this set of indicators and regression dependence in the construction of the production potential model of IT-companies is inappropriate.

If instead Tangible assets and Intangible assets we will take just Total assets, we will receive these results, in the table 18 – 21.

Таблица 18. Evaluation of the production potential regression with the help of VHCHR *(computed with help of (Research +Wage Fund) and ROA).*

Source	SS	df	MS				
Model	5.6298e+16	3	1.8766e+16				
Residual	1.0501e+16	36	2.9168e+14				
Total	6.6799e+16	39	1.7128e+15				

Number of obs = 40
F(3, 36) = 64.34
Prob > F = 0.0000
R-squared = 0.8428
Adj R-squared = 0.8297
Root MSE = 1.7e+07

revenue	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
employees	75.06875	22.38773	3.35	0.002	29.66434	120.4732
totalassets	.4542239	.0980601	4.63	0.000	.2553487	.6530991
vhchr	1.038721	.4657523	2.23	0.032	.0941319	1.983311
_cons	8083850	5417807	1.49	0.144	-2903971	1.91e+07

Source: Table computed by the author.

Таблица 19. Evaluation of the production potential regression with the help of VHCHR *(computed with help of (Research +Wage Fund) and ROA).*

Source	SS	df	MS		
Model	5.5490e+16	3	1.8497e+16		
Residual	1.1309e+16	36	3.1413e+14		
Total	6.6799e+16	39	1.7128e+15		

Number of obs = 40
F(3, 36) = 58.88
Prob > F = 0.0000
R-squared = 0.8307
Adj R-squared = 0.8166
Root MSE = 1.8e+07

revenue	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
employees	67.70507	22.81994	2.97	0.005	21.42408	113.9861
totalassets	.5175528	.1002972	5.16	0.000	.3141407	.7209649
vhcgro	.74959	.5239653	1.43	0.161	-.3130609	1.812241
_cons	7268844	5601370	1.30	0.203	-4091261	1.86e+07

Source: Table computed by the author.

Таблица 20. Evaluation of the production potential regression with the help of VHCHR *(computed with help of (Research +Wage Fund) and ROA).*

Source	SS	df	MS		
Model	4.6040e+16	3	1.5347e+16		
Residual	5.7028e+15	26	2.1934e+14		
Total	5.1743e+16	29	1.7842e+15		

Number of obs = 30
F(3, 26) = 69.97
Prob > F = 0.0000
R-squared = 0.8898
Adj R-squared = 0.8771
Root MSE = 1.5e+07

revenue	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
employees	99.04078	22.57482	4.39	0.000	52.63758	145.444
totalassets	.3784669	.0951412	3.98	0.000	.1829015	.5740324
vhchro	2.681533	.6917924	3.88	0.001	1.259533	4.103532
_cons	323727.9	6117197	0.05	0.958	-1.23e+07	1.29e+07

Source: Table computed by the author.

Таблица 21. Evaluation of the production potential regression with the help of VHCHR *(computed with help of (Research +Wage Fund) and ROA).*

Source	SS	df	MS			
Model	4.4967e+16	3	1.4989e+16			
Residual	6.7753e+15	26	2.6059e+14			
Total	5.1743e+16	29	1.7842e+15			

Number of obs = 30
F(3, 26) = 57.52
Prob > F = 0.0000
R-squared = 0.8691
Adj R-squared = 0.8539
Root MSE = 1.6e+07

revenue	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
employees	90.21904	24.56386	3.67	0.001	39.7273	140.7108
totalassets	.4237801	.1061426	3.99	0.000	.2056009	.6419593
vhcgr	2.571303	.8803449	2.92	0.007	.7617277	4.380877
_cons	-841108.1	6678084	-0.13	0.901	-1.46e+07	1.29e+07

Source: Table computed by the author.

Constructed models have a high coefficient R2, which indicates their high predictive power. And all the coefficients have the correct sign. This allows us to use a specified set of indicators and analyzed regression dependence in the construction of the production potential model of the company in the industry.

Now we can test the Hypothesis:

H0= There is no leaner relationship between Value of human capital and Revenue of the company.

H1= There is leaner relationship between Value of human capital and Revenue of the company

For the model with VHCHR, VHCHRO and VHCGR P values of human capital value are low (0.001, 0.032 and 0.007) with the 5% confident interval, we can reject H0. It is mean that there is a leaner relation between Value of human capital and capitalization of the company.

However, model with VHCHRO have bigger explanatory power (R2= 0.89) then others which is mean that for calculation of human capital value is better to use (Research +Wage Fund) and RONA). Coefficient of this model is 2.68, which is means that if we will increase Human Capital value by one unit we will increase our Revenue by 2.68.

For the model with VHCGRO, we cannot reject H0. It is mean that there is no a leaner relation between Value of human capital (calculated with help of Goodwill and RONA) and capitalization of the company.

Analysis of the data obtained indicates that the estimated regression dependence can be seen as a basis for constructing a model of the company's capitalization, and for the evaluation of human capital it is better to take VHCHRO (Research + Wage Fund) and RONA).

The results do not contradict the hypotheses stating that the proposed calculations can be used to assess the human capital in the production potential model, and the model which determines in the company's capitalization.

Conclusion

The present stage of the world's scientific, technical and social and economic development is characterized by a fundamental change in the role and importance of the human factor in the economy and society. Human capital becomes the most important factor of economic growth. According to some estimates, in the developed countries, increase in the duration of education for one year leads to an increase in gross domestic product (GDP) by 5-15%

We shall note the following:

- the nature of the impact of human capital on economic processes in various countries may be different, due to the measurement error of the "learning" variable, disregard of its qualitative features, endogeneity and multicollinearity of evaluation results;

- policies aimed at improving the educational level of the population has an impact on the rate of accumulation of human capital, the level of science and technological development in the country, creates the preconditions for the production and effective use of technology;

- the dynamic external effects of human capital accumulation are expressed in increased revenues from direct taxes in subjects' consolidated budgets, activation of patent activity and increase of the intensity of use of information, computer and new production technologies and in increase of the volumes of foreign investment in economy (including direct ones), elevated activity in the small entrepreneurship field, and decrease of unemployment level, as well as increase of population employment growth rates and production growth rates (actual GRP) and thus actual earnings of the population.

In a post-industrial innovative economy, human capital acquires a number of essentially new features and properties: the simultaneous consumption and accumulation during use; the anticipating growth and development (compared with other forms of capital); capacity for internal systematization by means of the aggregate qualitative and quantitative characteristics of the person – a holder thereof; multiplicative capacity and, accordingly, the value; the ability to create useful goods without the participation of natural and material capital; performing basic and integrating functions within the system of the national capital, dominating and integrating role of the element of knowledge in the content and structure of the human capital as meaningful, decoded and organized information.

Thus, human capital appears as a factor that determines the success or failure in the activities of individual companies, it acts as a generator of scientific and technological progress, which changes the structure of the national economy, in which the production actually goes by the wayside under the pressure of the complex of non-material industries and sectors that provide growth of the productivity of labor in social production.

The graduation thesis research studied the subject of assessment of the relationship between the parameters of the market value of the company's assets, results of production operations and human capital of the company. For the analysis the data on ten largest issuer companies in the IT-sector from 2008 to 2014 have been collected.

The paper presents two hypotheses, and several models of regression analysis. The findings of the study were generally in line with expectations. Although we cannot say exactly what indicator is best to be used in the calculation of human capital because in the Capitalization model the goodwill is more appropriate, while in the Income model the Wage + Research is more appropriate, but we can say with confidence that RONA is the best to be used for the calculation in both models.

The analysis confirmed that human capital has a significant impact on the financial performance of the company, as well as the stability of the company to external factors and its perception by the market. Nevertheless, one can assume that they could have been adjusted in some extent if a larger sampling of the companies had been made.

The proposed formula can be used to assess the value of human capital. Developed models are sufficient for determine the effective structure of the company with taking into account human capital. The main factor of using VHC formula to calculate the human capital is the availability of the data (from balance sheet, profit and loss statements), that is why it is possible for calculating human capital with the help of secondary data.

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