

Intellectual and Digital Industrial Enterprise as a Way for Becoming the Industry's Leader

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ABSTRACT

The economy of any modern state should ensure the intensification of intellectual processes in production, especially in industries. If the economic policy of the country is almost impossible to influence by economic entities, the management of intellectual development within the enterprise and at the micro level will allow to acquire significant competitive advantages. The stepped-up the use of intellectual capital at the level of economic entities will allow to launch innovative processes not only at the enterprise itself, but also will have an impact on the whole industry and even on territorial associations. The article discusses the relationship between the level of intellectual development of an enterprise and its situation in the industry. The purpose of the work is to determine the efficiency of production activities relative to industry average indicators through the use of intellectual capital. To achieve the goal, it is proposed to consider the relationship between intellectual capital value added and economic value added, to identify their dependence and to justify the possibility of comparison with industry average indicators of economic value added. The practical significance of the proposed approach will allow to assess the position of the enterprise in the industry by the volume of economic value added, taking into account the level of intellectual development of the company, and to develop recommendations on intellectual capital management in order to maximize value.

Keywords: *Intellectual capital, innovative economy, industry leadership, intellectual rent, intellectual development, competitive advantage.*

1. INTRODUCTION

At the end of the last century, researchers in the field of economic development noted the pattern that efficiency depends not only on material capabilities, but also on many intangible factors, such as social environment, education, science, medicine and so on. This has led to a shift in the prevailing paradigm and the development of theories about the emergence of a new type of knowledge-based economy. The main element of such an economy is intellectual capital. It is intellectual resources at the current stage of development that make not only economic entities competitive, but also the national economy.

Maintaining competitiveness requires the management system to adapt to market trends in a timely manner. Thus, sustainable development through material and financial resources alone is not appropriate. Benefits through the rational use of intangible assets will increase key performance indicators and achieve leadership positions [1]. The importance of the intellectual processes of modern society requires a more comprehensive study of the role of intellectual capital in the development of industrial relations, as the enhancement of the intellectual component is an integral factor in the construction of an innovative economy [2].

The practice of developed countries indicates the high efficiency of the introduction of intellectual property into economic turnover. The use of intellec-

tual capital allowed to get extra profit to the economic activity entity. At the global level, there is a positive trend in the application of patents, industrial designs, trademarks, licenses for exclusive rights in economic activities, the commercialization of which brings not only efficiency gains, profitability, but also allows to obtain additional competitive advantages in the market environment [3], [4].

Intellectual capital is directly related to the innovation activity of the enterprise. Through sound management of intellectual resources, it is possible to ensure sustainable development of an innovative and active enterprise based on synergistic influence of intelligent components. Unfortunately, intellectual capital is a non-adaptive resource and cannot be precisely structured based on existing models, which leads to the need to address the problem in a comprehensive manner.

The article analyzes the possibility of considering the level of intellectual development of an economic entity from the point of view of compliance with the industry average level, as well as the possibility of managing intellectual capital to achieve leadership in the industry. In order to do this, One has to:

- Analyse theoretical research on intellectual issues in industry, as well as the relationship between intellectual capital and economic value added;
- Build a model for determining the economic value added (EVA) of an innovative enterprise, as well as the possibility of comparing it with

the indicators of value added of intellectual capital (VAIC);

- Build a model for identifying the possibility of correlation of EVA and VAIC indicators to compare them with industry averages and the possibility to develop recommendations on the resulting dynamics.

The objects of research are intellectual capital and economic added value of the enterprise. The subject of the study is relations arising in the process of intellectual capital management in an industrial enterprise.

The relevance of the study is the importance of intellectual capital for economic efficiency at all levels of government, as evidenced by an enough works in this area. With intelligent resource management, it is possible to provide industry leadership for the operation of the enterprise and to implement penetration into new markets.

2. BUILDING A THEORETICAL BASE FOR RESEARCH

The separation of intellectual capital into an independent object of economic and management relations is beyond doubt in the scientific environment. It is intellectual resources that determine the competitiveness of the economies of the most developed countries and are the foundation of post-industrial society. As early as the second half of the 20th century, the works of Druker [5] examined the processes of the managerial revolution, consisting in the movement of the main production force from industrial workers and peasants to, so-called, "knowledge workers." Since then, the restructuring of the management system has begun, which is constantly dynamic and supplemented by new research.

From the point of view of economic theory, problems of intellectual capital are well studied and sufficiently developed. Classical works are those of Schultz [6], [7] and Stewart [8], who were the first to talk about the importance of intellectual transformation in the economic sphere both at the state level and among economic entities. These works justified the need to invest in human capital and innovation to build a new type of economy.

Economic value-added issues were first studied in the works of Finegan [9], which introduced an indicator reflecting the ability of an enterprise to generate profits on available capital. It is assumed that intellectual capital at the present stage of development is the main determinant of value creation, on which this study is built.

The increasing development of neo-economic theories leads to a revision of many concepts. Intellectual capital becomes not only a way to increase the efficiency of production activities and maximize profits, but also allows to ensure an enough level of intellectual rent, which in the future can influence not only economic, but also social issues of social relations.

The knowledge economy forms new needs of society, which leads to the creation of life benefits of intellectual quality. Therefore, from the production point of view, it is necessary to ensure that the level of intelligent processes is enough to ensure the greatest efficiency. To studying of influence of intellectual property on growth of production efficiency in the conditions of digital transformation of economy and technological development such authors as Marginson et al. [10], Zhilenkova et al. [11], Rokov et al. [12]. The formation of intellectual capital depends on many factors discussed in Figure 1.

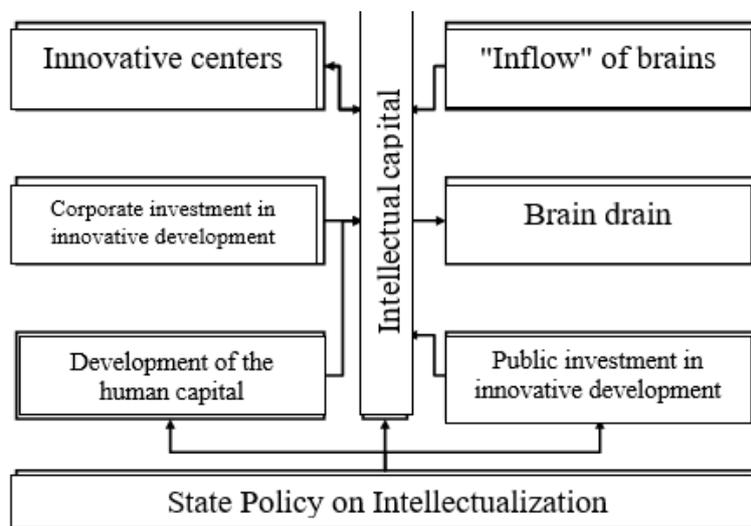


Figure 1 Formation of intellectual capital at the macro level

The main indicator of the efficiency of using intellectual capital in industrial production is the added value of intellectual capital (VAIC), detailed in Pulic et al. [13], Stahle et al. [14], Zaytsev et al. [3]. The special significance of this indicator lies in the possibility of its use in almost any industry, which allows to build dynamics and calculate industry averages with enough enterprises.

The high importance of intellectual resources for innovative modernization of territories was considered in the works of Rodionov et al. [15], Rudskaia [16], Kolmakov et al. [17]. Intellectual processes were considered by Kiseleva et al. [18], Nikolova et al. [19].

The monograph Manuylenko and Ermakova [20] proposes a tool for comprehensive assessment of intellectual capital of Russian corporations, including a tool for rating financial and non-financial assessment of intellectual capital, as well as a model for strategic evaluation of human capital.

Intellectual capital problems are considered over a long period, but no final decision has been taken in the area of fair valuation and regulation [3].

The adoption of intellectual capital management strategies has a direct impact on the creation of new value and the growth of capitalization of the company through the development of innovative products and services, the rationalization of business processes and the improvement of the quality of human resources.

Thus, further development of the problem of intellectual development is justified. It is proposed to build a model of their relationship based on existing works on intellectual capital, VAIC and EVA, taking into account the possibilities of comparison of industry indicators.

3. MODELING THE RELATIONSHIP BETWEEN INTELLIGENCE AND EVA FROM AN INDUSTRY PERSPECTIVE

Achieving leadership positions in the market requires the industrial enterprise to ensure the implementation of a competitive strategy that considers current economic trends. A competitive strategy is a set of activities aimed at acquiring certain advantages that increase the efficiency of production activities, the level of capitalization and such indicators as economic value added. Strong competition leads to many homogeneous projects in the industry aimed at innovative development, production of new products and introduction of technologies, in order to meet their competitors. Market analysis allows you to highlight industry-average intellectual dynamics and average economic value added, which will allow you to identify leaders and lags, as well as

develop recommendations for managing intellectual capital to match the most successful companies.

To begin with, the industry average value added of intellectual capital (VAIC) must be calculated. The indicator of each individual enterprise can be calculated according to the formula Ante Pulik:

$$VAIC_{(X)} = \frac{(Output - Input)}{\frac{HC}{Output - Input - HC} + \frac{(Output - Input)}{(Output - Input)} + \frac{CE}{CE}}, (1)$$

Where $VAIC_{(X)}$ – Added value of intellectual capital of enterprise X;

$Output$ – total income;

$Input$ – the cost of the spent means;

HC – human capital;

CE – the invested capital.

In order to obtain industry averages, it is necessary to calculate for all enterprises of the industry and to output an arithmetic average. In some industries there is a heterogeneity of enterprises, which can lead to a large dispersion of indicators. In the event of a significant variation in the industry, it is recommended to group enterprises by group, for example, by approximately equal amount of assets or by territorial location. The general formula of the industry average VAIC calculation is as follows:

$$VAIC_{(\Sigma)} = \frac{\sum(VAIC_{(1)} + VAIC_{(2)} + VAIC_{(3)} + VAIC_{(n)})}{n}, (2)$$

$VAIC_{(\Sigma)}$ – Average industry value added of intellectual capital;

$VAIC_{(1)} + VAIC_{(2)} + VAIC_{(3)} + \dots + VAIC_{(n)}$ – Sum of VAIC indicators by industry;

n – Number of enterprises in the industry.

If it is not possible to calculate the arithmetic mean due to the uniqueness or limitations of the industry, the expert evaluation method or other methods recommended by those skilled in the art may be used.

The next step is to calculate the economic value added in the enterprise and its industry average. It is recommended to calculate EVA indicator using standard formula:

$$EVA_{(X)} = NOPAT - WACC * IC, (3)$$

$EVA_{(X)}$ - economic value added of enterprise X;

$NOPAT$ - net operating profit after taxes;

$WACC$ - weighted average cost of capital;

IC - investable capital.

To calculate industry averages, use the formula:

$$EVA(\Sigma) = \frac{\sum(EVA_{(1)} + EVA_{(2)} + EVA_{(3)} + \dots + EVA_{(n)})}{n}, \quad (4)$$

$EVA(\Sigma)$ - the industry average intellectual added value;

$EVA(1) \dots EVA(n)$ - sum of VAIC indicators by industry enterprises;

N is the number of enterprises in the industry.

It is also necessary to calculate NOPAT and WACC * IC in an industry-average manner to obtain graphical data display.

If there is a significant difference in quantitative results, it is possible to introduce a generalized measure of economic efficiency ($EVA(\alpha)(X)$), which is the economic value added per enterprise asset. The indicator is calculated both by enterprise and by industry average. It is possible to change assets to other indicators, such as net assets or equity. The formula is as follows:

$$EVA(\alpha)(X) = \frac{EVA(X)}{A(X)}, \quad (5)$$

$EVA(\alpha)(X)$ is a generalized measure of the economic efficiency of enterprise X ;

$EVA(X)$ - economic value added of enterprise X ;

$A(X)$ is the sum of the assets of enterprise X .

Next, it is proposed to identify the correlation between the dynamics of the selected indicators, that is, the statistical relationship between the values. The higher it is, the greater the relationship between the efficiency of the use of intellectual capital and the economic value added obtained. The EVA factor can be replaced by a generalized indicator (EVA/A). The correlation formula is as follows:

$$r_{(VAIC \& EVA)} = \frac{COV(VAIC \& EVA)}{\sigma_{(VAIC)}\sigma_{(EVA)}} = \frac{\sum(X - X^*)(Y - Y^*)}{\sqrt{\sum(X - X^*)^2 \sum(Y - Y^*)^2}}, \quad (6)$$

The value obtained will indicate a close relationship between the indicators. In order to improve the efficiency of the proposed method, it is recommended to calculate data only at a correlation coefficient exceeding 0.5.

The business entity should strive to maximize EVA to achieve leadership performance in the industry. If intelligence has a significant impact on production efficiency and there is a positive correlation between VAIC and EVA, it is necessary to manage intelligent resources to exceed industry averages. That is, at $r(VAIC \& EVA) \geq 0$ approach of the situations considered in table 1 is possible.

Table 1 Possible situations and recommendations

Situation	Recommendations
$VAIC(X) < VAIC(\Sigma)$ $EVA(\alpha)(X) < EVA(\alpha)(\Sigma)$	Carry out measures to increase the VAIC indicator, as there is a dependence of efficiency on the use of intellectual capital.
$VAIC(X) < VAIC(\Sigma)$ $EVA(\alpha)(X) > EVA(\alpha)(\Sigma)$	The company operates quite efficiently, but measures to increase the VAIC indicator will increase efficiency from the use of intellectual capital.
$VAIC(X) > VAIC(\Sigma)$ $EVA(\alpha)(X) < EVA(\alpha)(\Sigma)$	Despite the sufficient efficiency of using intellectual capital, it is necessary to look for problems in production.
$VAIC(X) > VAIC(\Sigma)$ $EVA(\alpha)(X) > EVA(\alpha)(\Sigma)$	The enterprise takes a leading position in the industry and operates quite efficiently, it is recommended to look for other ways of increasing the cost.

In Figure 2 the example of the successful enterprise is represented and the excess added value (VA)

received for the account of effective use of intellectual resources is reflected. Maximizing this indicator allows to reach branch leadership.

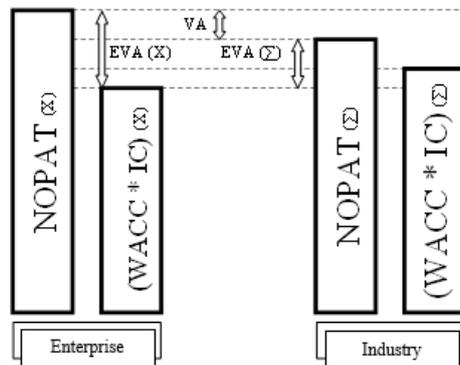


Figure 2 Graphical review of EVA indicators

Achieving leadership positions requires maximizing the VA score. It is also possible to consider regression dependence:

$$VA_{(x)} = \alpha * EVA_{(x)}, (7)$$

$$EVA_{(x)} = \beta * VAIC_{(x)}, (8)$$

$$VA_{(x)} = \alpha * \beta * VAIC_{(x)}, (9)$$

α и β - Regression coefficients at VAIC and EVA.

The received model can reveal shortcomings of use of the intellectual capital, however for stable and sustainable development of the innovation-active enterprise it is necessary to carry out an optimum ratio of dynamics of development of separate components of the capital. Even when maximizing VAIC the absolute efficiency of activity is not guaranteed that demands more complex consideration of interrelation of intellectual resources on totals.

4. CONCLUSIONS

Creation of economy of knowledge results in need of reorganization of the existing control systems and dictates need to move away from production of goods. The efficiency of productions at the present stage is in direct dependence on innovative development and quality of the intellectual capital. For achievement of leader positions in the industry it is necessary to realize the viable competitive strategy constructed on innovations and capable to provide long-term sustainable development due to activation of intellectual processes.

Importance of development of intellectualization for the developing economies, such as Russian, consists in an opportunity not only to pass into post-industrial society, but also to provide penetration on less developed markets, to occupy poorly developed niches and to increase the competitiveness in the world market [21].

Despite difficulties of definition of the intellectual capital, it became a key competitive factor in the conditions of formation of innovative economy long ago. In this regard the existing methods and approaches to assessment of the intellectual capital will only be improved, including and in total with development of methods of the financial analysis [3], [22].

Separately It should be noted that current trends are directed to socialization of relations of production. Thus, the modern enterprises have to implement socially important projects which reduce economically added profit at the moment, but further bring social effect, so-called, to investment into future development. Such projects influence quality of life of the population that in the long term will allow

to get profit and to increase capitalization at the expense of non-material factors, for example, growth of goodwill or improvement of quality of the human capital [23].

Management of the intellectual capital at the modern enterprises is the important direction in the development strategy and includes development of the technical, information, public and other directions allowing to intensify innovative processes. Knowledge as the main evolutionary development are in constant dynamics, adaptation to which will allow to reach leader positions in the segment of the market and to get successfully on the new markets.

The organizational moments are rather studied. However, not much attention is at the moment paid to justification of mathematical dependencies. Authors offered tool approach for calculation of cost efficiency as excess of economic added value over the industry average indicators due to use of the intellectual capital. It can be demanded at the enterprises of various sectors, will give the chance to compare the companies among themselves by the sizes of intellectual resources and to develop recommendations about their more rational use.

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