Assessing the impact of intellectual capital on economic growth

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***Abstract**:The article explains the elements that have the largest share in intellectual capital and explains the possibility of quantitative assessment of the specific weight of these elements in intellectual capital. Here on the example of the Republic of Azerbaijan on the basis of statistical data the value of works and services on intellectual capital in Azerbaijan is analyzed, as well as the dynamics of added value created at the expense of intellectual capital. In the article, the impact of added value created by intellectual capital on economic growth in Azerbaijan has been evaluated in the software package Eviews-12.*
***KEYWORDS:** INTELLECTUAL CAPITAL, VALUE ADDED, GLOBALIZATION, FIRM, CORRELATION, REGRESSION, MODEL, ADEQUACY, CRITERION.*

1. Introduction

In the context of economic globalization, exporting knowledge-intensive products is an enhancement of competitiveness among the countries of the world for every industrialized country and one of the most important means of further improvement is direct investment and the sale of licenses. High technology, based on intellectual capital, plays a decisive role in maintaining and strengthening the competitive position of these countries among the world states in modern conditions. The main result of financial and economic activity for each enterprise is to provide customers with information and successful solution of organizational problems. At present, for this purpose, international and local consulting companies are operating in most countries of the world, covering various spheres. When evaluating the activities of consulting firms, it is important to consider the high importance of personnel qualifications aimed at creating profit as the final result of the financial and economic activity of the enterprise. All this shows that the modern approach to assessing the real value of the company, in addition to determining how those or other decisions affect the value of the enterprise, also includes the type of assets (tangible and intangible) that represent the value of the company [1].

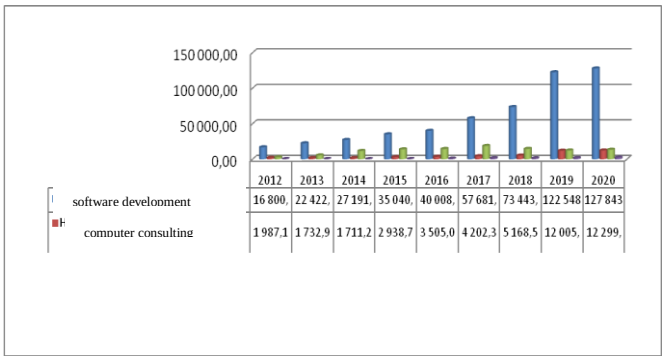
2. Main part

Since intellectual capital is an intangible asset, as an economic category it also includes other elements of national wealth in the form of technology, know-how, which cannot be separated from fixed assets, and cultural value. The elements with the largest share of intellectual capital in the structure of the national wealth of each country are advanced technology, fundamental science and university science. These elements can be quantified by their weight in intellectual capital.

It should be noted that the quality of intangible assets plays a key role in shaping the value of companies. Since intangible assets play a decisive role in the formation of enterprise value in the long term, enterprises without intangible assets will have no value in the long term [2, 3]. Intangible assets are primarily social human capital, which affects the economy as a whole, and individual human capital, which is directly related to individual corporations. In a globalized world economy, modern firms rich in intangible assets are producers of knowledge rather than goods. The efficiency gains achieved in many organizations are the result of specialized knowledge, long-term learning, and interaction with partners and counterparties. Instead of physical assets or financial capital, intellectual capital becomes a sustainable competitive advantage. The structure of intellectual capital includes human, organizational and consumer capital [4, 5].

As seen from the structure of intellectual capital, the use of technical software in organizational capital, patents, trademarks and technical software on elements of the organizational structure is important as one of the factors affecting the organization of optimal regulation of the financial and economic activity of enterprises.

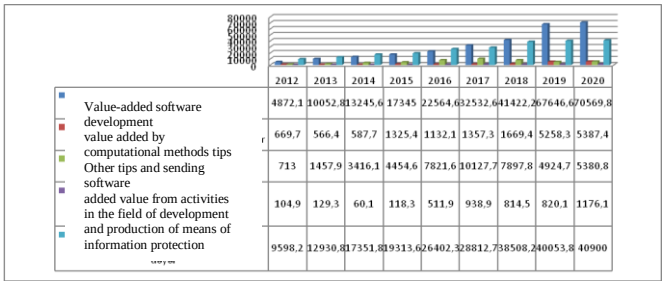
The diagram below shows the dynamics of added value due to the provision of technical software in the Republic of Azerbaijan.



***Graph 1:** Dynamics of the cost of works and services on intellectual capital in the Republic of Azerbaijan, in thousands manats*

Source: prepared by the author on the basis of data [3].

As can be seen from the diagram, the works and services performed on software development within the organizational capital of knowledge-intensive intellectual capital developed with increasing dynamics during 2012-2020. There was a 7.9-fold increase in 2020 compared to 2012. Despite the effects of the COVID-19 pandemic, the value of software development work and services increased by 4.3% in 2020 to AZN 127.8 million compared to 2019. Computer consulting, other consulting and activities in the field of design and production of information protection tools and services were also observed with a similar increasing trend during the study period. The increase in work and services performed in the design and production of information protection tools in software processing, computer consulting, other consulting and information protection tools in the organizational capital of knowledge-intensive intellectual capital from 2012-2020 contributed to the formation of value added in these areas with increasing dynamics. This can be seen more clearly in the graph below.



***Graph 2:** Dynamics of added value created at the expense of intellectual capital in the Republic of Azerbaijan, in thousands manats*

Source: prepared by the author on the basis of data [3]

As can be seen from the diagram, the added value created by works and services performed in the field of software development, computer consultancy, other consultancy and activities in the field of design and production of information protection means within

the organizational capital for 2012-2020 in the Republic of Azerbaijan has developed with increasing dynamics.

3. Econometric evaluation of the impact of knowledge-intensive intellectual capital on economic growth

It should be noted that an important role in the formation of economic growth in the country plays an added value created at the expense of work and services performed in the field of design and manufacture of information protection, software development, consulting on computer technology, other consulting and information protection. According to statistical data on GDP and science-intensive intellectual capital the dependence between them can be estimated by conducting a regression analysis. For this purpose ready packages of mathematical programs EViews, MatLab, MS Excel, MathCad and others can be used. In this regard, using the software package Eviews-12 for the above analysis, we obtain the following result.

Table. *The result of the regression relationship between GDP and knowledge-intensive intellectual capital in Azerbaijan*

Dependent Variable: Y
Method: Least Squares
Date: 02/11/22 Time: 21:20
Sample: 2008 2020
Included observations: 13

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X	0.061289	0.012207	5.020846	0.0002
C	-3059.061	954.2056	-3.205872	0.0004

R-squared	0.696207	Mean dependent var	1716.985
Adjusted R-squared	0.668590	S.D. dependent var	470.5494
S.E. of regression	270.8870	Akaike info criterion	14.18192
Sum squared resid	807177.6	Schwarz criterion	14.26883
Log likelihood	-90.18247	Hannan-Quinn criter.	14.16405
F-statistic	25.20889	Durbin-Watson stat	1.082202
Prob(F-statistic)	0.000030		

Source: developed by the author on the basis of the Eviews software application

Based on the result obtained with the Eviews application software package, the regression equation will have the following form:

Y = 0.0312885943991*X - 2036.06110137 (1)

According to Eviews application software package, there is a high correlation relationship, expressed by the model Y = 0.0313*X - 2036.061, between the dependent variable Y, which represents GDP in Azerbaijan, and the explanatory variable X, which represents knowledge-intensive intellectual capital (R2=0.696).

Based on this established relationship equation, it can be concluded that a one unit increase in the factor (X), which represents the amount of knowledge-intensive intellectual capital, led to a 0.031 unit increase in the volume of GDP in Azerbaijan. As we can see, the standard errors of the coefficients of the dependent variable X and the free limit C in the data of table (1), obtained by the software complex Eviews-12, are less than the average value of the coefficients. This means that model (1) is statistically significant [6, p. 315].

It is important to check the adequacy of the established model, which is determined by the F-Fisher test. To check the statistical significance of the model (1), which expresses the regression equation $F_{table}\,(a; m; n-m-1)$as a whole, we should compare it with the value of Fisher's F-criterion [6, p. 315]. According to table (1), reflecting the result of the software package Eviews,

F-statistic (Fisher's criterion) = 25,21

If you determine the tabular value of F in EXCEL using the formula $F_{table}\,(a; m; n-m-1) = Finv$, for a 99% confidence interval $F_{table}\,(a; m; n-m-1) = Finv(0{,}01; 1; 11) = 9{,}65$ Fisher's F-criterion, $F_{table}\,(a; m; n-m-1)$ if you compare its value, you can see that Fisher's F-criterion (25,21>9,65). This means that the regression equation as a whole is statistically significant [6]. It means the adequacy of established model (1).

The conclusion about the presence or absence of autocorrelation in the model can be made on the basis of Darbon-Watson statistics in Table 1, obtained on the basis of the EViews application software package. As can be seen from the table, it is equal to DW=1,082. In this case the Darbon-Watson critical points for 1 $\alpha = 0{,}05$ explanatory variable (m=1) and n=13 observations would be as follows [6, 7].

$d_l = 1{,}010,\ d_u = 1{,}340$

$$d_l = 1{,}010 \le DW = 1{,}082 < d_u = 1{,}340$$

as the conclusion about the presence of autocorrelation is not established [6. p. 311]. It means, that regression equation as a whole is statistically significant and established model Y = 0,0313*X - 2036,061 is adequate.

As a result of the study for the linear regression equation (1) we can determine how much the result factor will change because of the cause factor by calculating the elasticity coefficient, which expresses the percentage change in the dependent variable as a result of a 1% change in the independent variable. This coefficient is calculated according to the following formula [5, 6].

$$E = \frac{\alpha_i \times \bar{x}_i}{\bar{y}} \ (3.2)$$

Here $\alpha_i$coefficients of the above relational equation, $\bar{x}$ - average score of the causal factor for the periods under study , $\bar{y}$- average score of the resulting factor for the periods under study. The elasticity coefficients calculated on the basis of these scores, in accordance with the established model, will be as follows.

$$E_{inv.} = \frac{\alpha \times \bar{x}}{\bar{y}} = \frac{0{,}0313 \times 1716{,}985}{65742{,}046} = 0{,}000817$$

4. Conclusions

The calculations show that a 1% increase in knowledge-intensive intellectual capital leads to a 0.00082% increase in GDP in Azerbaijan.

For the linear regression equation (1) above, the study can determine how much the outcome factor will change due to the cause factor by calculating the elasticity coefficient, which expresses the percentage change in the dependent variable as a result of a 1% change in the independent variable.

5. References

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