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Abstract: *This article is devoted to the consideration of issues related to the formation of the world intellectual property as well as costs spent on creation of research and experimental developments. In addition, the article analyzes the issues of assessment and organization of innovative products. In the context of global globalization, intellectual property objects are crucial in assessing the property of enterprises. However, the methodology of analysis of intangible assets has not been comprehensively presented in scientific works. therefore, this article developed a methodology for the analysis of intangible assets, in particular the analysis of intellectual property.*

Key words: *ecosystem, artificial intelligence, additive technology, intellectual property, research and experimental-development activities, patent, industrial sample, useful model, invention, intellectual property fixed assets analysis accounting balance methodology following indicators the correlation dependencies raise.*

Introduction

As far as we know, currently the volume of the market of intellectual property objects and innovation products is rapidly increasing throughout the world. In particular, the market of **"**artificial intelligence"- (AI) rose from 31 percent and in 2017 this indicator accounted for 3 billion USD, and in 2018 this figure constituted 8,1 USD and this year it has amounted to 13,4 billion UZS. Moreover, it is expected, that by 2022 this indicator will total 52,5 billion UZS (Frost & Sullivan**,** 2019). This, in turn, requires creation of the intellectual property ecosystem and its further development. Moreover, development of the intellectual property market will be mainly connected with the creation of this ecosystem. It should be noted, that the concept of "Intellectual property ecosystem" appeared in foreign countries many years ago and currently it approached the level of development. For example, in the USA the intellectual property ecosystem is referred to the Silicon Valley which unites major venture companies, investors, tart-ups and entrepreneurs. The reason for this that head offices and lab rooms of the famous world-wide known companies and giants of the electronic industry (Apple, Google, Facebook, Intel, AMD, Electronic Arts) are located there. They are involved in the development of intellectual projects and this fact results in the creation and further development of intellectual property ecosystem, which, in turn, leads to ensuring innovative globalization.

Literature review

In terms of the world globalization, the data on the intellectual property objects is crucially important when assessing the property of enterprises because currently

innovative development is considered to be one of the top priorities for companies to raise the volume and value of intellectual property objects. This, in turn, requires a particular attention to be paid not only to accounting but also to economic analysis.

It should be noted that the system of indicators which represent the state and conditions of intellectual property objects hasn't been created by scientists and experts who have developed scientific papers in the field of economic analysis. In particular, I. Abdukarimov considers intellectual property objects as a component of intangible assets as a major source for the analysis of the accounting balance sheet analysis. However, the methodology for the analysis of intangible assets has not been comprehensively presented in scientific works (the author provides a comprehensive analysis of the status and use of fixed assets in his research).

The first approach to the analysis of intellectual property objects in our country has been made by M. Pardaev [1] who has demonstrated these objects as a component of intangible assets in the following indicators:

- indicators that reflect the state of intangible assets;
- indicators that reflect the efficiency of intangible assets.

Indicators of intangible assets include their total volume, average annual cost, their share in total assets, and depreciation ratio of intangible assets.

In addition, A. Vakhobov and A. Ibrokhimov studied the issues on only fixed assets and methodological aspects of analysis of their use [2].

In the opinion of M. Bakanov and A. Sheremet, balance indicators, including intangible assets, constitute the source for economic analysis. However, there is lack of precise information on the methodology for the analysis of production inventories and there is almost no data on intangible assets (intellectual property objects) [3].

O. Tolpegina and N. Tolpegina focus on the analysis of long-term assets, including comprehensive analysis of depreciable property. Herewith in terms of the analysis scientists have evaluated only fixed assets among the depreciable property [4] .

According to the view of M.Abryutina, intangible assets have become one of the most significant indicators of the balance sheet and play a particular role as the analysis technique. This scientist has not developed any methodology for analyzing precisely intellectual property objects [5].

N. Kazakova in her research focuses on the issues of diagnosing the state and development of business, where she considers intangible assets as one of the key indicators in the analysis of the balance sheet [6].

The Russian scientist T. Grigoryeva in her scientific paper considers the status of intangible asset analysis is part of the company's property performance indicators. In addition, in the process of the analysis of the company's liquidity ratios she attributes intangible assets into a group of the assets which are difficult to sell. At the same time, the research of this scientist does not fully regulate the order of analysis of intellectual property objects [7].

According to N. Voytolovsky, the analysis of intangible assets is included in the financial analysis and taken into consideration in the analysis of the property structure. Moreover, it is stated by the scientist that it should be used as a source of analysis in calculating profitability indicators, though he has not specifically mentioned intellectual property objects [8].

From the point of view of S. Dybal, the methodology for the assessment of the enterprise's property focuses on the horizontal and vertical analysis of intangible assets, paying a particular attention to their structure and composition. Intangible assets, in the form of patents and licenses resulting from innovative activities, indicate that they have a very small share in the overall property of the enterprise [9].

In addition, V.Bocharov has studied the structure and dynamics of intangible assets by means of horizontal and vertical analysis of their current state [10].

Furthermore, Russian scientists O. Yefimova and L. Dontsova have conducted the research on the analysis of intangible assets as well. For example, O.Yefimova provides information on the methodology for the analysis of intangible assets, as well as the primary objectives of the analysis: the composition and structure of intangible assets, estimation of sources of funding and their efficient use. Nevertheless, the scientist provides insights into the methodology for analyzing the composition and structure of intangible assets (however, she hasn't developed the efficiency indicators system) [11].

It is obvious, the scientific paper of this economist can be considered as one of the first works on the analysis and assessment of intangible assets as a separate object of analysis.

Moreover, L.Dontsova focuses on the analysis of intangible assets in the field of analysis of depreciable assets. The analysis of intangible assets requires revealing of their volume, structure and dynamics. It is the first time when the scientist considers the analysis of the structure and composition of intellectual property objects [12].

Analysis and results

In the world practice, the concept of intellectual property ecosystem includes owners of intellectual ideas, creators of intellectual property objects and series of manufacturers of innovation products. This concept can be expanded by the following statements:

first stage: creators of intellectual ideas or projects (institutes, universities). Projects and developments on the certain intellectual property object, as well as new formulas are created at this stage;

second stage: sample and form of intellectual property objects are created at this stage. For example, industrial samples (on spare parts of motor vehicles);

third stage: the sample of the intellectual property object undergoes through experimental testing (industrial samples, useful models and inventions). Then this processed is followed by the commercialization of this product. In particular, herein the industrial production of this sample starts. For example, the industrial sample on the spare part of the motor vehicle is purchased by the manufacturer.

The intellectual property ecosystem can also be called an innovative ecosystem. The innovation ecosystem is the complex of human, financial and other resources in the process of the commercialization of innovations and their interrelations aimed at interacting with the process of commercializing innovations and their enhancing commercializing and optimizing innovations. From these stages it is obvious that the intellectual property ecosystem will provide an opportunity for innovative development of the industry in whatever area it is selected. That, in turn, leads to an increase in the volume of innovative products in the economy. This requires an increase in the cost of innovation in any country.

In the nearest future (over 10-15 years) innovative globalization will lead to the development of the technologies applied to the qualitative changes throughout the world. In addition, nowadays the tendency of the formation and development of the "intellectual property ecosystem" hasn't been adequately developed yet. In this regard it is expected that within next decade huge amounts of investments will be made in such sophisticated technologies as Bio Robot Refrigerators, internet solar panels 5G (Project Skybender), 5D storage devices (Superman memory crystal), oxygen particle injection, underwater transport tunnels (Hyperloop), bioluminescence trees, folding TVs, biological lenses for unusual viewing, spray clothing, DNA-originated portraits, unmanned vehicles, a city under the dome (Mall of the World), carbon dioxide and solar-fueled artificial leaves, plasma area to protect against accidents, floating cities (Lilypad), 3D printed copies, bionic insects for human organ transplantation operations (BionicANT), search for a new life in a human being that can live 1 000 years and another life in space (FAST), etc.

Creation of these technologies as new objects of intellectual property will definitely require significant costs. Currently in the developed countries of the world a particular attention is paid to research activities and experimental development. That is, there is a significant increase in deductible spending on the GDP of these countries.

Table 1

The share of regions in terms of expenditures on research activities in relation to the gdp[1]

Regions of the world	Expenditures on R&D in relation to the GDP, %	Share in relation to total number of researchers, %
North America and Western Europe	2,4	39,7
East Asia and the Pacific	2,1	38,5
Central-Eastern Europe	1,0	10,6
Latin America and the Caribbean	0,7	3,7
The Arab countries	0,6	3,9
South - West Asia	0,5	1,9
Africa	0,4	1,1
Central Asia	0,2	0,6

In North America and Western Europe, the average amount of expenditures on creating intellectual property constitutes 2,4 percent in relation to the GDP, thus totaling 99,7 percent of researchers around the globe. It is also a high indicator in the countries of East Asia and the Pacific (2,1 percent) and covers 38,5 percent of researchers. However, this situation cannot be considered as positive in the Central Asian region, as the share of expenditure on R&D amounts to only 0,2 percent in relation to the GDP and the share of developers of innovation products accounts for 0,6 percent. For example, the countries with the highest spending on research and development in terms of the GDP around the globe are South Korea (4,3 percent), Israel (4,2 percent), Japan (3,8 percent) and Sweden (3,1 percent).

[1] UNESCO Institute for Statistics (UIS). http://uis.unesco.org/sites/

Table 2

Data on the expenditures made on the r&d and experimental developments in relation to the gdp of the world countries[2]

Countries	Expenditures in relation to the GDP		Number of researchers by one million people (number of people)
	in percent	billion USD	
South Korea	4,3	73,1	6856
Israel	4,2	9,9	8250
Japan	3,4	131,8	5328
Sweden	3,1	14,2	6877
Germany	2,9	109,5	4318
USA	2,7	476,4	4217
France	2,3	38,5	4233
Singapore	2,2	10,0	6729
China	2,0	370,6	1096
Great Britain	1,7	43,8	4254
Russia	1,1	40,3	3094
India	0,8	48,0	156
Kazakhstan	0,2	0,718	790
Uzbekistan	0,2	0,342	500

The amount of expenditures in relation to the GDP accounts for 476,4 billion USD in the USA, 370,6 billion USD in China, 131,8 billion USD in Japan and 109,5 USD in Germany. The most important thing is that up to this day the USA has mastered almost 6 USD or 38 percent of the GDP having produced intellectual property objects for this amount. It should be noted that the number of people who create intellectual property objects and are involved in research activities constitute 8250 people in Israel, 6856 in South Korea, 6877 in Sweden, 6729 in Singapore and 5323 in Japan.

This means that during recent years significant efforts have been made in Asian countries to create innovative products. However, this situation cannot be considered positive in the countries of Central Asia. In particular, in Kazakhstan the number of researchers per one million constitutes 790 people, and in Uzbekistan this indicator accounts for 500 people. In India this indicator constitutes 156 people per one million, but the share of expenditures on research and development accounts for 0,8 percent (48,8 billion UZS) in relation to the GDP. Unfortunately, this indicator does not exceed 0,2 percent in the countries of Central Asia (Kazakhstan and Uzbekistan).

The analysis illustrates that the main part of expenditures in relation to the GDP refers to the business sector. It is obvious that expenditures directed to business development will be highly efficient. Among the analyzed countries we have the following statistics in terms of creating intellectual property objects (innovation developments): South Korea 78,0 percent (or 57,2 billion UZS), Japan 77,5 percent (131,8 billion UZS), China 77,3 percent (286,5 billion UZS) and the USA 71,4 percent (340,7 billion USD).

[2] UNESCO Institute for Statistics (UIS). http://uis.unesco.org/sites/

Table 3

Distribution of overall expenditures on innovation developments[3]

Countries	billion USD			
	Business sector	Public administration	Education system	Non-commercial sector
South Korea	57,2	8,2	6,6	1,1
Japan	131,8	14,1	21,3	2,2
USA	340,7	54,1	62,3	19,2
China	286,4	58,6	25,5	-
Russia	24,0	12,2	3,9	0,51
Great Britain	28,5	3,2	11,2	0,793
India	17,0	29,0	1,9	-
Germany	74,1	16,0	19,4	-
Sweden	9,5	0,531	4,1	0,34
France	38,5	7,7	13,4	0,915
Singapore	6,2	1.1	2,7	-
Israel	9,9	0,217	1,5	0,116
Kazakhstan	0,263	0,235	0,159	0,60
Uzbekistan	0,108	0,166	0,64	0,3

According to the data presented in Table 3 it is obvious that in terms of expenditures directed to the education system (universities) which represent the first stage of the intellectual property ecosystem, France is playing a leading role with 34,8 percent or 13,8 billion USD, then - Great Britain with 25,5 percent (11,2 billion USD) and Germany with 17,7 percent (19,4 billion USD). However, in terms of creating the innovation production to the public administration, the share of Russia accounts for 12,2 billion USD and the share of India amounts to 60,4 percent which equals to 29,0 billion USD. In Uzbekistan the share of expenditures on the business sector amounts to 31,5 percent, on the public administration - 48,5 percent and on the education system - 18,7 percent, in Kazakhstan these indicators constitute 36,7 percent, 32,7 percent and 22,1 percent respectively. It should be noted, that from these figures it is obvious that the country focuses on innovation and makes huge investments in innovation developments.

As a result, agencies and companies in these countries currently have a worldwide reputation and their revenues are rapidly growing every day. This implies that the costs of research and development activities will be very efficient and rewarding in future. The welfare of such countries will be enriched not just by tangible assets, but by intangible assets based on innovative ideas.

The following indicators constitute the most significant indices of economic potential of intellectual property objects:

- indicators that reflect the state of the intellectual property objects;
- indicators that reflect the performance of the intellectual property objects;
- indicators that reflect the efficiency of the intellectual property objects.

[3] UNESCO Institute for Statistics (UIS). http://uis.unesco.org/sites/

This research represents an empirical analysis which has been performed to determine the impact of intellectual property objects on the sale of goods. After all, each business entity has the ultimate aim to enhance the amount of intellectual property objects focusing more on selling, reducing the prime-cost of the goods manufactured and improving its production efficiency, which will definitely lead to strengthening its market position.

Intellectual property objects, long-term assets and current assets have been accepted as factors affecting proceeds from the sale. The reason for performing an empirical analysis by types of assets is that enterprise's assets play a key role in the production of assets. The descriptive statistics of the variables specified above are presented in the table (Table 1):

Table 4

Descriptive statistics analysis for the intellectual property objects[4]

Indicators	Proceeds from sales of products	Intellectual property objects	Long-term assets	Current assets
Medium	2312060501	14971664.64	1768873084	1029396462
Standard deviation	3477179347	31022214.4	3019015268	2050982284
Minimum	47098879	14000	6934845	1372562709
Maximum	10261781347	102822702	10222335009	6291970206
Number of objects	11	11	11	11

As the analysis of the descriptive statistics illustrates that the standard deviation of proceeds from sales and long-term assets is quite bigger than of other variables due to the fact that enterprises are operating in different areas. According to the minimum value, the value of "AAA" enterprise which has the least number of intellectual property objects among other business entities constitutes 14 million UZS. The value of "BBB" enterprise which has the biggest number of intellectual property objects among other business entities accounts for over 102 billion UZS. An important part of the empirical analysis of the correlation of these variables is presented in the following table: as the correlation matrix of variables (Table 2):

According to the correlation matrix, the correlation between the proceeds from sales and the other variables demonstrates a positive correlation. It should be noted that the correlation of proceeds from sales with intellectual property objects is much higher than the correlation with other variables.

The correlation between types of assets is also positive and the correlation between intellectual property objects and current assets is highly dependent. This implies a careful approach to the outcome when inputting these two variables into the regression model because such a high correlation of the independent variables can cause a multicollinearity problem.

The correlation dependencies enable to provide a more comprehensive view of the linear model. Therefore, below there are presented correlations of some variables of natural logarithms. From the Figure given below it is obvious that there is a high positive correlation between the proceeds from the sales of goods and other variables.

[4] http://www.openinfo.uz/ru/reports/jsc/annual

Table 5

Intercorrelation matrix of variables[5]

	Proceeds from the sale	Intellectual property objects (Intangible assets)	Long-term assets	Current assets
1. Proceeds from the sale	1.00			
2. Intellectual property objects	0.68	1.00		
3. Long-term assets	0.44	0.08	1.00	
4. Current assets	0.57	0.83	0.42	1.00

Herein the empiric model can be represented in the following way:

$$VCT_i = \mathrm{a} + \mathrm{b}NA_i + \mathrm{g}X_i^j + \mathrm{e}_i$$

where $VCT_i - i$ - proceeds from the sales of goods, $NA_i - i$ – intellectual property objects (intangible assets), X_i^j – other assets included in the model, ε_{ijt} – error.

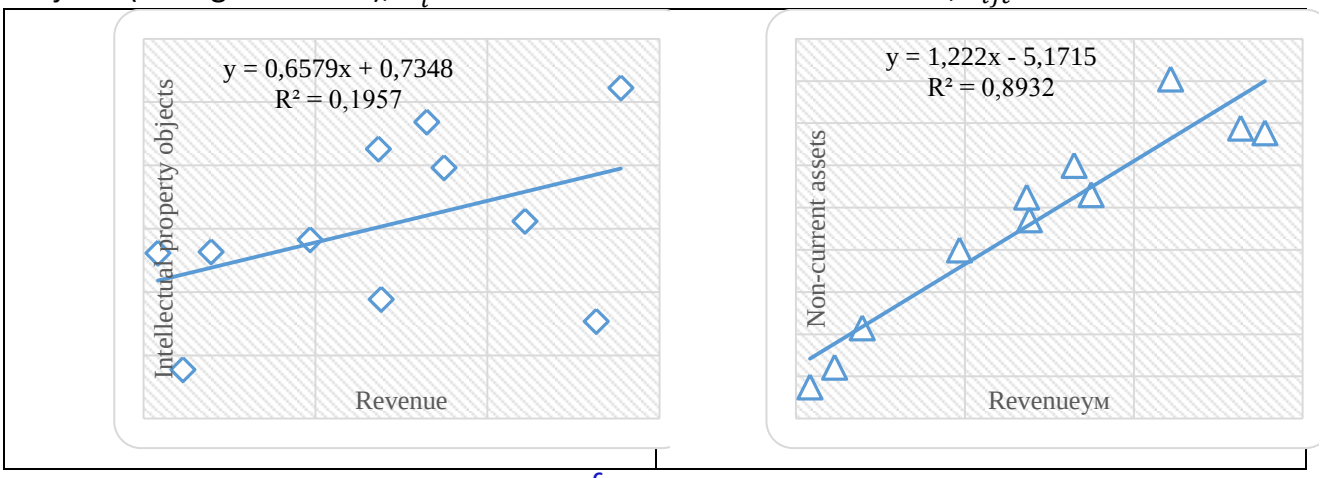

Figure 1. Linear chart of variables[6].

The main aim of conducting regression analysis of the intellectual property objects is opportunity to calculate how the increase of the intellectual property objects by 1 UZS will raise the proceeds from sales. The following Table demonstrates three models that have been calculated by the least square method (Table 3).

Table 6

Regression model results[7]

	Model [1]	Model [2]	Model [3]
Intellectual property objects (Intangible assets)	76.67** (27.25)	73.02** (24.67)	143.95** (48.29)
Long-term assets		0.44 (0.25)	0.76** (0.30)
Current assets			-1.33 (0.80)
Constant	1164125369 (903486969)	433932776 (915439957)	171611221 (844394064)
R-square	0.47	0.62	0.72

[5] Author's development.

[6] Author's development.

[7] Author's development.

*** statistic significance of 1 per cent
** statistic significance of 5 per cent
* statistic significance of 10 per cent

According to the results of various models of regression analysis, positive impact of intellectual property objects on the proceeds from sales has been confirmed on the basis of the empirical analysis. The impact of intellectual property objects on the proceeds from sales of goods in all peculiar properties of all models is considered positive and has high social significance.

According to the models, it is possible to make a conclusion that an increase of intellectual property objects (intangible asset) of any enterprise by 1000 UZS will result in average increase of proceeds from sales by 98000 UZS.

Conclusions

By 2023 Uzbekistan has been assigned the task to reach and be included in the list of 50 top countries by Global innovation index. To achieve this aim, the following measures must be successfully implemented: ensuring intensity of scientific developments (R&D Intensity), the degree of the Value Added Tax in production process (Manufacturing Value-added), productivity, High-tech Density, Tertiary Efficiency, Researcher Concentration, Patent Activity.

Efficient criteria for the intellectual property ecosystem in innovative globalization are as follows:

first, a successful intellectual property ecosystem will focus on the commercialization of innovative products;

second, a successful intellectual property ecosystem will ensure consistent, gradual change of ideas;

third, a successful intellectual property ecosystem is a collaborative network of professionals who provide continuity in the creation of innovative products.

In conclusion it should be noted that improvement of analyzing intellectual property objects it will enable to:

- assess changes by the structure of the intellectual property objects;
- assess the state and flow of the intellectual property objects in terms of their structure;
- evaluate amendments in the ownership right and the right to dispose intellectual property objects;

Moreover, the development of intellectual property ecosystems in our country requires creation of relevant accounting system. This, in turn, necessitates strengthening the regulatory framework for the elements that constitute this ecosystem. As a result this will enable to recognize their accounting as new objects, to conduct their evaluation and account as long-term assets.

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