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ABSTRACT

of the dissertation for the degree of Doctor of Philopsophy

ISSUES ON IMPROVING THE QUALITY OF INTELLECTUAL CAPITAL IN THE COUNTRY'S ENTERPRISES

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GENERAL CHARACTERISTICS OF THE RESEARCH

Relevance and Degree of Development of the Research. Throughout all historical periods, *knowledge* has served as the driving force behind the development of humankind. Through knowledge, people have been able to act purposefully, transforming scarce resources into new goods, products, and services. In modern conditions, the paradigm of economic and technological development is undergoing a fundamental shift. While the old paradigm emphasized the mass production of standardized goods by intensively utilizing production resources, the new paradigm, on the contrary, relies on improving the quality of production processes and goods, as well as their diversification.

Today, business entities distinguished by high productivity and flexibility—achieved through the application of new technologies that require fewer raw materials and resources—are increasingly widespread. As a result of globalization, such transformations observed in developed countries have also affected Azerbaijan. In the contemporary era, unexpected changes in the external business environment compel organizations to seek adequate responses. Accelerating innovation processes and encouraging creative approaches in every field create favorable conditions for overcoming the challenges faced by business structures.

Behind the organization, management, financing, supply, sales, marketing, and other business processes of individual goods and services lies *technology*. Technology embodies the knowledge required to carry out various activities. In the information society, technology has become an inseparable part of people's daily lives and serves as a criterion for development. In post-industrial civilization, professional activity increasingly shifts from entrepreneurial entities to households. Under such conditions, it becomes impossible to fully predict the outcomes of intellectual activities as processes. However, knowledge always emerges as the result of intellectual effort.

The individualization of knowledge further enhances the significance of the intellectual property system. Intellectual property encompasses not only scientific, artistic, and literary works but also

inventions, discoveries, industrial property, industrial designs, trademarks, and trade names covering all spheres of human activity.

The sustainable and inclusive development of Azerbaijan's economy presupposes enhancing the competitiveness of business organizations. However, this cannot be achieved without the introduction and assimilation of new technologies for the production and sale of goods and services. By patenting intellectual and industrial knowledge, trademarks, or any invention, an organization or individual can gain exclusive competitive advantages within a specific market and for a certain period of time. Leveraging such advantages enables business entities to expand their market share and market capitalization across different products.

The use of new products and technologies transforms the dynamics of traditional competitive rivalry among businesses. To avoid falling behind successful companies in the competitive race, business organizations are compelled to pay greater attention to intellectual activities, scientific research, and experimental design work. Therefore, the role and significance of intellectual capital in business development are undeniable. Studying the various attributes and aspects of intellectual capital constitutes a highly relevant issue for both economic and management science and practice.

The conduct of intellectual activity requires addressing a number of critical issues, particularly the creation of a creative environment, the formation of a reputable research team, the development of a vision towards new technologies, the promotion of this new vision, and the formulation of strategies for the application and utilization of new technologies.

However, local business organizations do not accord adequate importance to the creation and protection of intellectual property. In other words, most organizations operating in the republic lack the necessary knowledge and experience to define long-term strategic visions, intentions, and objectives within a market environment, as well as to develop and implement intellectual activity strategies that facilitate achieving these goals.

The external business environment is characterized by uncertainty and is shifting from stability towards dynamism. The

continuous emergence of innovations and the relentless development of technological knowledge constitute the primary factors generating uncertainty in this environment. Therefore, investigating the systematic, processual, and comparative approaches to the new features of intellectual activity emerges as a significant scientific and practical issue.

Thus, the study of the creation and management of intellectual capital within economic entities, as well as the enhancement of its quality, holds substantial scientific and practical importance and is becoming increasingly relevant.

The formulation of the problem in this manner necessitated the writing of a dissertation on this subject.

Research on the Problem. A number of domestic and foreign economists have conducted studies on this topic. Among Azerbaijani scholars, A.J. Muradov, G.N. Manafov, T.A. Guliyev, A.P. Babayev, A.Sh. Shekeraliyev, U.K. Alakbarov, H.S. Hasanov, U.G. Aliyev, M.A. Ahmadov, Sh.T. Guliyeva, I.A. Kerimli, A.D. Huseynova, A.N. Muradov, T.N. Aliyev, F.Q. Mikayilov, and other researchers have examined human resources, human capital, innovative economy, management, and related issues. However, they have not specifically investigated the aspects of intellectual capital management and the acceleration of its application.

Foreign scholars such as T. Stewart, L. Edvinson, E. Brooking, K. Sveiby, H. Becker, N. Ikujiro, B. Lev, N. Bontis, S. Winter, A. Slivotsky, B.B. Leontiev, Richard R. Nelson, V.L. Inozemtsev, T. Buzen, and others have conducted distinctive scientific research in the formation of intellectual capital and its application in production.

Considering the crucial importance of the materialization of intellectual capital among the pressing challenges of our time, it is evident that the study of various components and parameters of the intellectual labor system must be continued.

Object and Subject of the Research. The object of the research is the study of the level of intellectual capital application in economic entities operating in our country. The subject of the research encompasses the various components of production, social, and managerial relations arising during the application of new intellectual

technologies in economic entities, as well as the formation and utilization of intellectual capital.

Purpose and Objectives of the Dissertation. The purpose of this research is to investigate the theoretical issues of intellectual capital that contribute to enhancing the competitiveness of the country and individual entrepreneurial entities, as well as to identify approaches and methods for accelerating the application of intellectual capital in production.

In this context, the following specific objectives are set to be accomplished:

- To determine the characteristics of intellectual capital formation and its application in the economy;
- To assess the current development and protection of intellectual capital in the country;
- To analyze the current state of intellectual capital in economic entities and reveal trends of change;
- To study the features of the evaluation of key objects of intellectual capital;
- To analyze the mechanisms of intellectual capital management;
- To explore ways to improve the efficiency of intellectual capital application in the economy.

Main Statements Submitted for Defense:

- The historical aspects, scientific foundations, and methodology of the application of intellectual capital in the economy have been comprehensively and systematically investigated, resulting in the formation of a system of indicators;
- The generation, structure, and development of intellectual knowledge, which is the main component of intellectual capital, have been studied in depth, and the positive effects of extensive use of knowledge and new technologies in economic entities in the modern era have been identified;
- Problems arising during the valuation of intellectual capital objects have been analyzed, progressive global practices studied, and the current state of intellectual capital formation in Azerbaijan has been examined;
- A specially adapted Intellectual Capital Integral Index (ICII)

has been calculated to quantitatively express the development and utilization levels of intangible assets through three complementary spheres — education, science and technology, and new business — for assessing Azerbaijan's intellectual potential;

- The current state of intellectual capital in domestic enterprises has been studied through surveys conducted in these organizations, the obtained results evaluated, and the value of intellectual capital in a higher education institution (using UNEC as an example) has been calculated;
- The impact level of information and communication technologies on product output in economic sectors has been assessed;
- Well-founded proposals and recommendations reflecting ways to improve the application of intellectual capital in production, as well as to increase the efficiency of its implementation methods and tools within the context of innovative development under modern requirements, have been developed.

Scientific Novelty of the Research. The scientific novelty of this study lies in the fact that, for the first time in the context of Azerbaijan, a systematic attempt has been made to demonstrate the intellectual property vector in the transformation of the economy, the nature of the emergence of its objects, forms of development, and ways and methods to improve the quality of its application in production.

In general, the main scientific novelties of the dissertation are as follows:

- A specially adapted Intellectual Capital Integral Index (ICII) has been calculated to assess Azerbaijan's intellectual potential;
- Trends in the formation of intellectual capital in local enterprises have been identified based on sociological surveys;
- Measurement of intellectual capital in higher education institutions has been conducted;
- The impact level of information and communication technologies (ICT) on product output in economic sectors has been evaluated;
- Proposals have been made for improving the technology of intellectual capital development.

The theoretical and methodological section of the research includes the works and theoretical and practical ideas of classical

economists, as well as foreign and domestic scholars who have contributed to economic science, focusing on innovation development and intellectual capital. It also covers the relevant organizational and legal acts that shape the intellectual capital environment in Azerbaijan.

The theoretical basis of the research is grounded in scientific studies corresponding to the Fourth and Fifth Technological Revolutions.

The dissertation employs comparative and systematic analysis, analytical generalization and systematization, dynamics, historical approaches, as well as extensive use of individual and empirical observation methods.

Information-Empirical and Normative-Legal Basis of the Research. The information-empirical and normative-legal basis of the research consists of relevant normative documents from the branches of government of Azerbaijan, official statistical compilations of the State Statistical Committee, statistical publications and reports of international organizations, official websites, and annual reports reflecting the practical activities of various entrepreneurial structures. It also includes materials from international conferences and specialized periodicals.

In addition, materials published on the official websites of certain institutions have been utilized.

Theoretical and Practical Significance of the Research. The theoretical provisions of the research consist in that the conducted theoretical studies and proposed scientific approaches facilitate a clearer understanding of the system of relations between intellectual capital and intellectual property, as well as the development of effective measures for managing this system. The theoretical provisions advanced in most sections of the dissertation concerning specific problems can be utilized in scientific research related to innovation, creative management, and intellectual capital.

The practical significance of the research primarily lies in its contribution to the development of new knowledge and technologies, facilitating technology transfer and accelerating innovation processes. The implementation of the proposals and recommendations presented in this study can improve the application of technological knowledge

in production within business organizations. Simultaneously, the protection of industrial property within business structures grants them competitive advantages in various sectors and types of activities.

The materials of this dissertation can be used in teaching courses such as Innovation Management, Operations Management, Production Management, Creative Management, Strategic Management, Management, and others.

Approval and Application. The author has presented the theoretical-methodological and applied considerations proposed in the dissertation, as well as the recommendations and suggestions reflecting the essence of the work, at national and international scientific and scientific-practical conferences.

Name of the Institution Where the Dissertation Was Conducted: The dissertation was carried out at the Azerbaijan State University of Economics.

Structure and Volume of the Dissertation. The dissertation consists of an introduction (11,123 characters), three chapters combining 8 paragraphs (Chapter I – 80,147 characters; Chapter II – 83,099 characters; Chapter III – 61,237 characters), a conclusion (182,323 characters), and a bibliography, totaling 253,929 characters. The dissertation includes 34 tables, 27 figures, and a list of 190 references in Azerbaijani, Russian, and English.

STRUCTURE OF THE DISSERTATION

2.1. Current State and Main Trends of Intellectual Capital Formation in Azerbaijan
2.2. Evaluation of the Impact of Relationships among Intellectual Capital Components on Economic Growth across Economic Sectors in Azerbaijan
2.3. Determination of the Strategy for Intellectual Capital Management and Regulation
Chapter III. Prospects for Enhancing the Efficiency of Intellectual Capital in the Context of Innovative Development of the Azerbaijani Economy
3.1. Mechanisms for Improving the Application of Intellectual Capital in the Economy
3.2. Directions for Ensuring the Quality of Intellectual Capital as a Driving Force of the Innovative Economy
Conclusion
List of References

MAIN PROPOSITIONS PRESENTED FOR DEFENSE:

1. The historical aspects, scientific foundations, and methodology of the application of intellectual capital in the economy have been comprehensively and systematically investigated, resulting in the development of a system of indicators.

When examining the trajectory of intellectual capital, it becomes evident that societal development transitions—from the pre-industrial and industrial periods to the post-industrial era—have enhanced organizations' competitive advantages in the market. While in industrial societies natural resources were substituted by labor and capital, in post-industrial societies intellectual capital and knowledge predominantly prevail. Consequently, the nature of resources changes, as do human skills and types of activities, leading to the emergence of new dimensions and forms of employment sectors.

The contemporary concept of intellectual capital arises at the intersection of two approaches that reflect the input and output factors of economic entities' effectiveness: the resource-based view and value-based management. Both approaches have roots in economic

theory, primarily based on the works of David Ricardo and Alfred Marshall. The American economist and Nobel laureate Gary Becker applied economic methods to analyze human behavior, conducting theoretical and empirical analyses of human capital and elucidating the essence of investments in human capital in several of his works.

The catalyst for studying intellectual capital was initially the research conducted by the renowned American scholar Thomas A. Stewart. Regarding the geographic positioning of scientific schools studying intellectual capital, it is important to mention Canadian Nick Bontis, Swedish Karl Erik Sveiby, and Dutch Daan Andriessen. Today, these authors actively investigate the measurement, valuation, and accounting representation of a company's intellectual capital.

Modern economic literature features terms such as intellectual property, intellectual production, intellectual capital, and the intellectual class. However, economic linguistics does not impose specific requirements for clarifying the essence of these concepts. Intellectual processes are often equated with intellectual manifestations, as intellectual property is directly linked to any invention, utility model, or know-how.

Simultaneously, the institutional trajectory of intellectual manifestations' development in the economy reflects a robust mechanism of fundamental rules governing the movement of researchers' creative ideas. For instance, while the well-known theorist of intellectual capital Thomas Stewart characterizes it as the unity of human, structural, and customer capital, the majority of other researchers find no reason to disagree with this view.

Intellectual capital is a system of capitalized intellectual knowledge, whose creative use ensures the production of new intellectual goods and the generation of corresponding revenues. Intellectual knowledge refers to the knowledge that ensures the growth of wealth based on the reproduction of factors of production.

Research indicates that at the core of intellectual capital lies the knowledge actualized by its carriers, i.e., the employees of the organization. Thomas Stewart stated, "Intellectual capital is the accumulation of useful knowledge." Thus, the intangible nature of intellectual capital becomes evident.

Some researchers aim to study the specific weight of intellectual capital in the economy. Thomas Stewart concludes that tangible assets are being displaced by intellectual assets. He considers 1991 as the turning point in the United States from the industrial age to the information age. In that year, expenditures on acquiring information technology surpassed, for the first time, expenditures on industrial equipment.

Intellectual capital, along with other indicators, is one of the essential components of national wealth.

Table 1. The Essence and Components of Intellectual Capital

Researchers	What is Intellectual Capital??	Components of Intellectual Capital
E. Brooking	Intellectual capital is intangible assets essential for a company's existence and strengthening its competitive advantage	Human resources, intellectual property, infrastructure, and market assets
V.L. Inozemtsev	Information and knowledge take the form of intellectual capital within the boundaries of a company and are special factors due to their participation and characteristics in production	Human capital embodied in company employees' experience, knowledge, skills, innovation capability, as well as their contribution to the company's overall culture, philosophy, and internal values. 2. Structural capital, which includes patents, licenses, trademarks, organizational structure, databases, and electronic networks.
B.B. Leontyev	The total value of intellectual assets owned, including intellectual property, innate and acquired intellectual skills and habits, accumulated knowledge base, and beneficial relationships with other entities	Human capital, organizational (or structural) capital, and customer capital
L. Edvinson	A system of sustainable intellectual advantages of a given company or firm in the market	Human capital, organizational (or structural) capital, and customer capital

Source: Table compiled by the author

2. The generation, structure, and development of intellectual knowledge—the core component of intellectual capital—have been thoroughly studied, and the positive impacts of the extensive use of knowledge and new technologies by economic entities in the modern era have been identified.

V.S.Yefremov clearly correlates capital and knowledge, noting that

"…intellectual capital is the knowledge at the disposal of an enterprise, expressed in a clear and easily transferable form." Speaking about knowledge management, B.Z. Milner states that "it concerns the accumulation of intellectual capital, … creating a foundation for the dissemination and transfer of knowledge." Numerous analogous reasonings can be cited to reflect the interrelationship between intellectual capital and knowledge.

Firstly, it is hardly appropriate to group knowledge together with "experience, information, and intellectual property" or other elements that are not directly related to the essence of intellectual capital when explaining its nature. To understand the essence of intellectual capital, it is sufficient to focus solely on knowledge, since "experience" is the "result" of knowledge, and "intellectual property" is knowledge that has been formed and is ready for commercial use. As for "information," if the relevant data have not undergone the stages of actualization and capitalization, they may not qualify as knowledge.

Secondly, it is incorrect to define intellectual capital simply as the sum of all the knowledge of a company's employees or just the aggregation of several pieces of knowledge. Knowledge is more accurately attributed to intellectual potential rather than manifesting directly as "capital" that reflects profitable or "productive" value. This implies that not all intellectual knowledge can be used in the creation of concrete wealth. Only the knowledge that is directly applied in value creation qualifies as capital. Knowledge that is not utilized in reproduction remains in a "potential" state without acquiring creative "power." Therefore, intellectual capital should be defined precisely as a system of capitalized creative knowledge purposefully used for the reproduction of vital values. Naturally, not the entire spectrum of human knowledge is utilized during the application of any given wealth. It is also important to note that the greater the volume of overall intellectual knowledge, the more alternative options exist for intellectual-innovative activities. Conversely, limiting the overall knowledge system restricts the "conversion" of intellectual creative activity across various spheres, meaning it impedes the application of knowledge in diverse fields.

Thirdly, knowledge possesses a certain structure:

1. According to their genetic characteristics, knowledge has a multi-level

nature.

2. Based on their forms of expression, knowledge is divided into tacit and explicit knowledge.
3. The adequacy degree of knowledge's truthfulness is characterized by the relative truth of its content (essence).
4. As a product of human practice, knowledge embodies the "gene" of active use.

As observed, the essence of intellect and intellectual capital lies in intellectual knowledge. All transformations of the given knowledge lead to the formation of correspondingly modified forms of intellectual capital, which serve as the basis for new qualitative characteristics and valuations. An essential element and aspect of such characteristics is the structure of intellectual capital. In the modern era, new forms of intellectual capital capitalization exist, such as patents, know-how, trade secrets, and licenses. These constitute various types of information (inventions, original technologies, knowledge, skills, etc.) that are protected under commercial secrecy regimes and can be objects of purchase and sale or used as achievements to gain competitive advantages over other business entities. They can also be models and software increasingly applied across all spheres of society and its entities.

3. The challenges encountered during the valuation of intellectual capital objects have been analyzed, progressive global practices studied, and the current state of intellectual capital formation in Azerbaijan examined.

A significant challenge persists in the valuation of intellectual potential as a specific form of capital, which remains unsatisfactorily resolved to this day. The issue lies in the fact that the depreciation and value decline processes in intellectual potential differ from those in tangible assets. In the initial years, the activity of intellectual capital does not diminish as physical capital does; on the contrary, it increases due to the employee's physical growth, accumulation of production experience, and the economic value of their knowledge and skills reserve. An increase in the value of intellectual capital is thus observed.

In the contemporary world, a substantial portion of scientific research and studies is devoted to the valuation of intellectual capital. This is because intellectual capital directly influences business efficiency and

acts as a factor enhancing enterprises' ability to generate profit.

Various methods attracting attention are employed for the valuation of intellectual capital using different indicator systems. For explaining the classification of intellectual capital valuation methods, it is appropriate to refer to K.E. Sveiby's taxonomy. K.E. Sveiby divided all methods into four categories.

1. Scorecard Methods.
2. Market Capitalization Methods.
3. Direct Intellectual Capital Methods.
4. Return on Assets Methods.

Based on the generalization of the aforementioned concepts, it is possible to compile a special table (Table 2) reflecting the frequently used methods for intellectual capital valuation.

Table 2. Brief Characteristics of Intellectual Capital Valuation Methods

Valuation Method	Brief Description
D. Tobin's Q Ratio	The ratio of the market value of an asset to the replacement (exchange) cost of that asset
K.E. Sveiby Method	Intellectual capital is calculated based on a systematically ranked framework according to its significance. A chart is drawn based on indicators such as employee competencies and labor productivity
Market Capitalization Method	The differences between market value and book value are identified.
Technology Broker Method	The methodology consists of 20 questions. The fewer positive answers there are, the lower the level of intellectual capital
Norton and Kaplan's Balanced Scorecard System	Four specific indicator systems are selected: financial; customer; internal processes (innovation); learning and growth
Intellectual Capital Index	The methodology is aimed at creating a company's value landscape. The approach combines strategy, non-financial characteristics, financial metrics, and added value indicators.
Pulic Method	Determines the efficient use of three types of company resources: CEE (Structural Capital Efficiency), HCE (Human Capital Efficiency), and SCE (Customer Capital Efficiency).

Source: Table compiled by the author

Intellectual capital determines the pace and nature of production technologies and product renewal, providing enterprises with key competitive advantages in the markets. From this perspective, intellectual capital can be viewed as the embodiment of a stable and sustainable system of intellectual advantages for enterprises and companies in the market. The formation and development of intellectual capital is also reflected in the Human Development Index.

Table 3. Human Development Index of Countries in 2023[1]

Human Development Index Ranking	Countries	Human Development Index (Score, points)	Expected Years of Schooling	Mean Years of Schooling
	Very High Human Development			
1	Iceland	0.972	18.9	13.9
2	Norway	0.970	18.8	13.1
3	Switzerland	0.970	16.7	13.9
4	Denmark	0.962	18.7	13.0
5	Germany	0.959	17.3	14.3
5	Sweden	0.959	19.0	12.7
7	Australia	0.958	20.7	12.9
51	Turkey	0.853	19.8	9.0
57	Georgia	0.844	16.8	12.7
60	Kazakhstan	0.837	14.0	12.5
64	Russian Federation	0.832	13.2	12.4
69	Armenia	0.811	14.4	11.3
	High Human Development	-+		
75	Iran (Islamic Republic)	0.799	14.0	10.8
78	China	0.797	15.5	8
81	Azerbaijan	0.789	12.9	11.1
81	Mexico	0.789	14.5	9.3
86	Moldova	0.785	14.6	11.8
87	Ukraine	0.779	13.3	11.1
95	Turkmenistan	0.764	13.2	11.2
107	Uzbekistan	0.740	12.5	11.9

Source: Compiled by the author based on the 2025 report of the United Nations Development Programme

According to the 2025 Human Development Report published by the United Nations Development Programme (UNDP), which has been prepared and issued since 1990 reflecting the Human Development Index (HDI) of countries worldwide, Azerbaijan's Human Development Index for 2023 was evaluated at 0.789, ranking the country 81st. This indicates an improvement of 8 positions compared to 2022, when Azerbaijan was ranked 89th (see Table 3).

The Human Development Index is a composite measure that evaluates the average achievements in three basic dimensions of human development: long and healthy life, access to knowledge, and a decent standard of living. Azerbaijan's HDI value for 2023 is 0.789, placing it in the "High Human Development" category and ranking it 81st among 193

[1] https://hdr.undp.org/system/files/documents/global-report-document/hdr2025reporten.pdf

countries and territories. Notably, the 3.8% increase in Azerbaijan's HDI from 2022 to 2023 resulted in the country's rise from 89th to 81st place.

Table 4. Azerbaijan's Human Development Index for the years 2015–2023

Years	HDI Ranking	HDI (Value, points)
2015	78	0.749
2016	78	0.749
2017	80	0.752
2018	87	0.754
2019	88	0.756
2020	100	0.730
2021	91	0.745
2022	89	0,760
2023	81	0.789

Source: Compiled by the author

In the 2024 Intellectual Capital Ranking of world countries, Azerbaijan scored 39.01 points and ranked 94th (Table 5). As shown in the table, countries with highly developed science and new technologies—South Korea, China, and Germany—occupy the top three positions. It should be noted that the Intellectual Capital Index is based on indicators measuring the breadth of clusters such as education, research and development, and new business.

Table 5. Intellectual Capital Index for the Year 2024[2]

Country	Ranking	Score	Country	Ranking	Score
South Korea	1	77.86	Azerbaijan	94	39.01
China	2	75.00	Bosnia and Herzegovina	95	38.88
Germany	3	73.69	Fiji	96	38.68
Switzerland	4	72.16	Vanuatu	99	37.69
Japan	5	72.05	Egypt	100	37.63
United Kingdom	6	71.89	Chad	186	14.77
Sweden	7	71.53	Papua New Guinea	187	14.48
USA	8	70.14	Mauritania	188	14.13
Singapore	9	69.68	Eritrea	189	13.21
Finland	10	67.53	South Sudan	190	12.91
Denmark	11	67.44	Somalia	191	10.74

The analytical group of the World Economic Forum (WEF), together with Harvard University and the international consulting firm Mercer Human, publishes the rankings of countries according to the Human Capital Index. The Human Capital Index measures the contributions of

[2] *https://solability.com/the-global-sustainable-competitiveness-in dex/the-index/intellectual-capital*

healthcare and education to worker productivity. Analyzing the dynamics from 2013 to 2024, it is observed that our country experienced growth in this index in 2023, but in 2024, it declined by several positions.

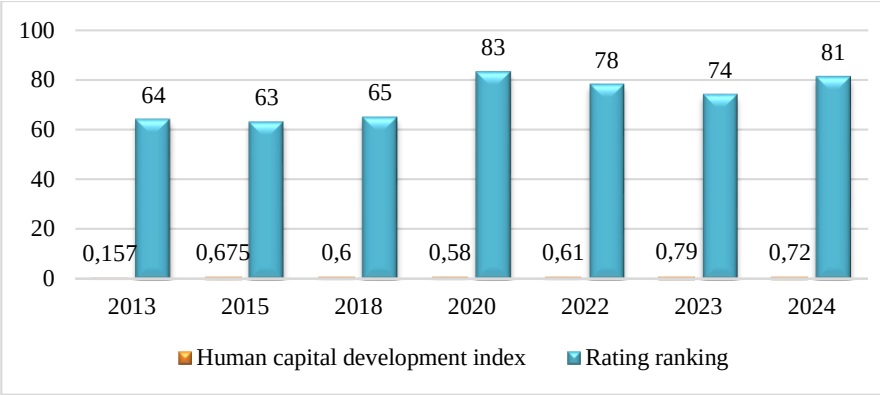


Figure 1. Human Capital Index Dynamics from 2013 to 2024[3]

Based on conducted research and the position held by our country in reports prepared according to the Global Innovation Index compiled by the World Intellectual Property Organization using data from 132 countries, it can be noted that despite the consistent implementation of reforms and state programs carried out in our country, sufficient results have not yet been achieved.

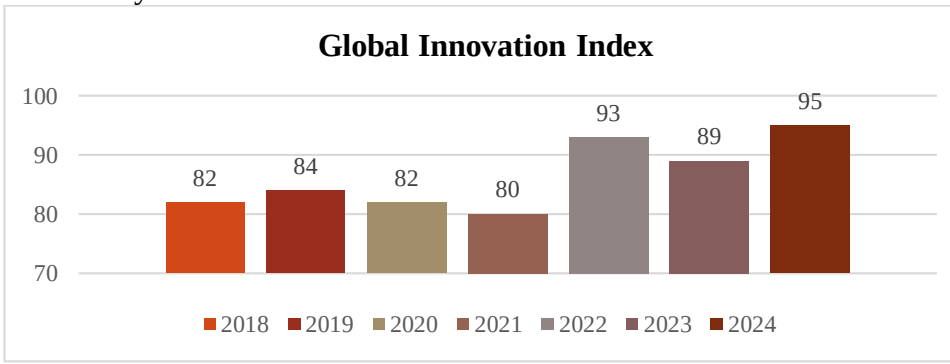


Figure 2. Dynamics of the Global Innovation Index of the Republic of Azerbaijan for the Years 2018-2024

Source: Compiled by the author based on the data from the website of https://www.copat.gov.az/

[3] https://datacatalog.worldbank.org/search/dataset/0038030

4. The Intellectual Capital Integral Index (ICII), specifically adapted for assessing the level of development and utilization of intangible assets through the complementary fields of education, science and technology, and new business in Azerbaijan, has been calculated to quantitatively express the intellectual potential.

The assessment of intellectual capital at both macro and micro levels is actively studied in the scientific literature. Modern methods involve the use of integral indices that incorporate several subcomponents, such as human, structural, and innovative capital. The main approaches used by leading researchers in this field are presented in the research works.

The methodology presented in the dissertation is a structured and logically constructed algorithm designed to calculate the Intellectual Capital Integral Index (ICII) specifically adapted for assessing Azerbaijan's intellectual potential. Based on the cluster approach, this methodology allows for the quantitative expression of the development and utilization levels of intangible assets through three complementary fields: education, science and technology, and new business. The methodology is built in stages.

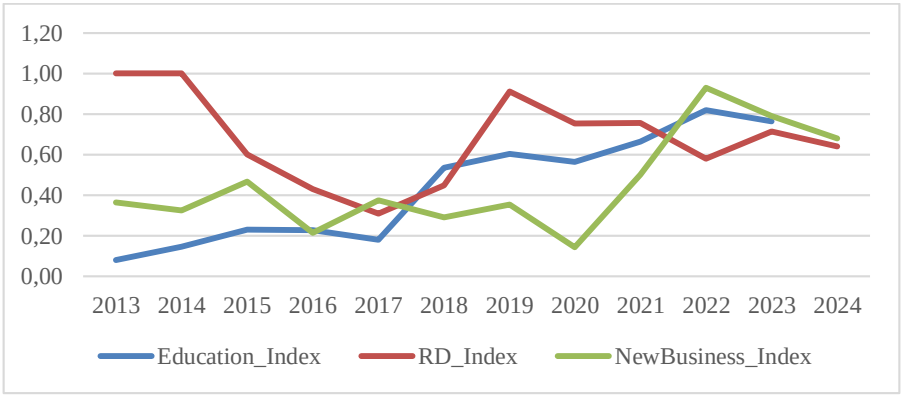


Figure 3. Dynamics of the Education, Science and Technology, and New Business Indicators for the Years 2013-2024.

Source: Compiled by the author.

This complex indicator focuses on the level of knowledge and education of the population, scientific research activity, innovation potential, as well as the level of entrepreneurial activity, particularly

components related to the commercialization of ideas and technologies.

The calculation methodology includes three main components: the RD_Index reflecting the level of research and development, the Education_Index characterizing the state of the education system, and the NewBusiness_Index related to business activity and innovative entrepreneurship.

The economic commentary highlights that the research and development sector has the greatest impact on the final index, especially during periods with high values. The education component gradually increases, and the low values of the corresponding index indicate a need for deep reforms in this area. The entrepreneurship activity index demonstrates instability, which reflects weak institutional support for innovative business and low efficiency of technology transfer mechanisms.

The overall conclusion is that the positive dynamics of the intellectual capital index is only possible with the parallel development of all three components. At the same time, individual bursts of activity, without a systemic approach, are incapable of ensuring sustained growth. The effective development of intellectual capital requires stable investments in education and scientific research, support for startups and entrepreneurial initiatives, as well as improvements in the conditions for knowledge transfer between science, education, and business environments.

5. The current state of intellectual capital in local enterprises has been studied through surveys conducted within these organizations, the obtained results were assessed, and the value of intellectual capital at a higher education institution (using UNEC as an example) has been calculated.

It should be noted that the general intellectual development criteria of the country can also be assessed based on the results of sociological surveys and observations conducted at specific enterprises. Within the framework of the research, sociological surveys and observations were carried out at medium and large entrepreneurial entities engaged in manufacturing activities in our country. Based on these sociological surveys, the intellectual capital in

the manufacturing sector and the possibilities for utilizing this capital in our country were analyzed. The main factor in the realization of intellectual capital, based on the surveys, is the formation of human capital and the possibilities for utilizing it.

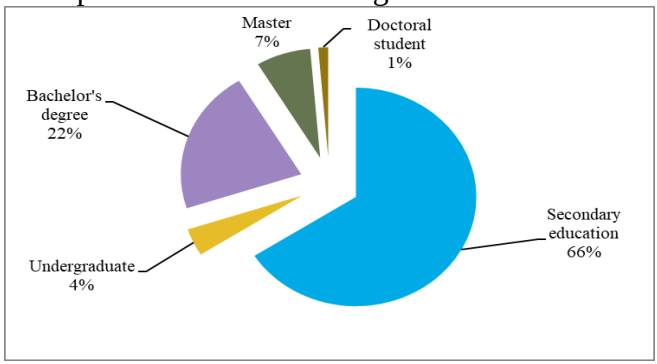


Figure 4. Proportion of Employees' Education Level in Enterprises, in Percentage.

Source: Compiled by the author.

As shown in the figure, the majority of human capital in these enterprises, approximately 66%, consists of individuals with secondary education. The staff from other educational levels include: 4% with sub-baccalaureate education, 22.5% with a bachelor's degree, 7% with a master's degree, and 1.0% with a doctoral education.

The distribution of this staff, in terms of experience, can be more clearly observed in the figure below.

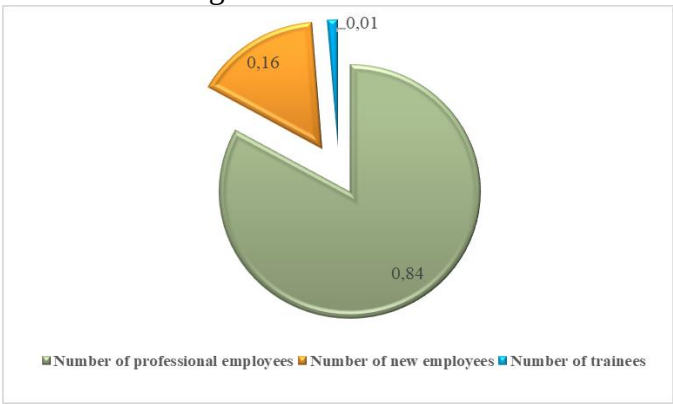


Figure 5. Proportion of Employees' Professional Skills in Enterprises, in Percentage.

Source: Compiled by the author.

As seen, the majority of employees in the enterprises (84%) are experienced workers, while the remaining 16% consist of employees with up to 3 years of work experience. Additionally, up to 10% of the employees in these enterprises are trainees.

Sociological surveys conducted in these enterprises also focus on work schedules and incentive measures. Specifically, these enterprises primarily operate with a shift work schedule. The working hours are regulated in accordance with the labor code, and the schedule is managed by the human resources department of these enterprises. To ensure employee motivation, a reward fund has been established, which is equivalent to 12.8% of the average salary fund of the enterprises.

Relationships with partners and other organizations are of particular importance to these enterprises. A closer look at communication practices in these enterprises shows that preference is given to formal cooperation, with contracts, memorandums, licenses, and joint projects being signed and implemented.

6. The impact level of information and communication technologies on product output in economic sectors has been assessed.

As noted, one of the main directions for improving the use of intellectual capital in economic sectors is the provision of these sectors with computer technologies, as well as increasing the use of the internet to organize the activities of these enterprises more efficiently. In this regard, analyses have been conducted with the help of dynamic indicators reflecting the computerization of enterprises and their internet access capabilities. The research has revealed that in 2005, only 20% of the operating enterprises used computer technologies, whereas the current figure has increased by 46.6%, reaching 66.6%. Similarly, the internet access capabilities of these computers have increased by 65.7% compared to 2005, reaching 84%. It should be noted that the increase in enterprises' access to the internet and computer technologies has had a significant impact on the overall volume of product output in the respective sectors. To assess the level of this impact, the Eviews software was used, and the following impact level has been determined.

$$LOG(X2)=-0.928634758941-0.574990241846*LOG(Y3)-0.531796928999*LOG(Y17)+1.27063126694*LOG(Y16)+0.581995222518*LOG(Y7)-0.389432296216*LOG(Y13)+0.311588730707*LOG(Y11)-0.0928696871302*LOG(Y9)$$

The value of $R^2 = 0.99$ indicates that the effect of the explanatory variable X_2 on the dependent variable Y is statistically significant, and the overall quality of the model is high. The Durbin-Watson statistic of 2.674 also confirms that the model is adequate. Additionally, the F-statistic for this model is Fsta = 158.4791, which is greater than 0, meaning the model is adequate to reality. Let us now provide an economic interpretation of the model.

Dependent Variable: LOG(X2)

Sample: 2005 2023

Included observations: 19

LOG(X2)=C(1)+C(2)*LOG(Y3)+C(3)*LOG(Y17)+C(4)*LOG(Y16)+C(5)
*LOG(Y7)+C(6)*LOG(Y13)+C(7)*LOG(Y11)+C(8)*LOG(Y9)

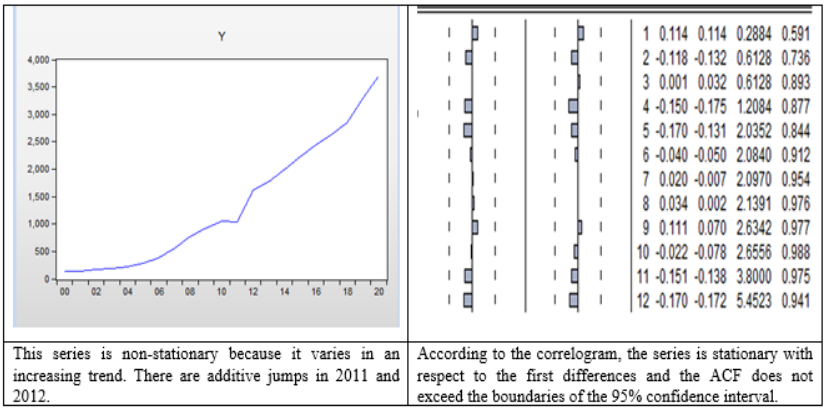
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.928635	0.358762	-2.588443	0.0252
C(2)	-0.574990	0.172265	-3.337818	0.0066
C(3)	-0.531797	0.119271	-4.458724	0.0010
C(4)	1.270631	0.123509	10.28772	0.0000
C(5)	0.581995	0.152613	3.813549	0.0029
C(6)	-0.389432	0.225555	-1.726553	0.1122
C(7)	0.311589	0.095270	3.270592	0.0075
C(8)	-0.092870	0.071625	-1.296615	0.2213

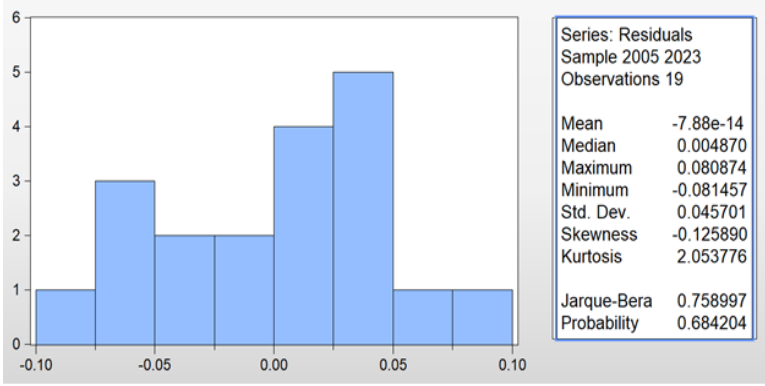
R-squared	0.990182	Mean dependent var	4.126893
Adjusted R-squared	0.983934	S.D. dependent var	0.461219
S.E. of regression	0.058461	Akaike info criterion	-2.545353
Sum squared resid	0.037595	Schwarz criterion	-2.147695
Log likelihood	32.18085	Hannan-Quinn criter.	-2.478054
F-statistic	158.4791	Durbin-Watson stat	2.674717
Prob(F-statistic)	0.000000		

Source: Prepared in Eviews software based on the data from the State Statistical Committee of the Republic of Azerbaijan - https://www.stat.gov.az

As seen from the established relationship, the quantitative dependencies between these indicators can be assessed using the correlation-regression method of econometric modeling.

The adequacy of the model obtained from the research further validates our evaluation. As indicated by the model, the connection of existing computers in enterprises to the internet increases the impact on overall product output. Specifically, a 1% increase in internet access in the model has the highest positive effect on the quality of education. This impact results in a 1.27% increase in the value added in the education sector. As seen, the expansion of information and communication connections plays a crucial role in the growth of product output. Moreover, the internet access capabilities of economic sectors have affected other sectors as well.





Source: Prepared in Eviews software based on the data from the State Statistical Committee of the Republic of Azerbaijan - https://www.stat.gov.az

Similarly, a 10% increase in internet access in these sectors has led to an increase in product output in the following areas: Trade, vehicle repair - 5.8%, Financial and insurance activities - 3.1%. The calculations show that, in contrast, in other sectors, it may result in a decrease in the volume of product output: Accommodation and catering for tourists - 0.09%, Healthcare and social services - 5.3%, Professional, scientific, and technical activities - 3.9%, Manufacturing industry - 5.7%.

All these findings further confirm the importance of efficient use of communication technologies, or more precisely, the development of intellectual capital.

7. In terms of modern requirements, well-founded proposals and recommendations have been developed to improve the application of intellectual capital in production, as well as to increase the efficiency of its application methods and tools.

It should be noted that, in order to improve the methodology for the application of intellectual capital in the economy, the first priority should be the development of an optimal management model for intellectual capital. To design an efficient model for managing intellectual capital, several fundamental requirements must be established. Based on management, marketing, product quality, competitiveness management, and kvalimetry, as well as other accumulated experiences, the main principles for applying intellectual capital in production have been identified: scientifically grounded, modeled, comprehensive, improved, dialectical, relative, and so on.

The improvement of the methodology for applying intellectual capital in production holds a special place in contemporary economic literature. A notable issue here is the development of a specific methodology for intellectual capital to achieve the goals of innovative development in enterprises. It is important to note that intellectual capital, as a significant resource, does not merely function as a non-production force within society. Rather, intellectual capital, as a specific socio-economic institution, emerges as a priority source for public development. Therefore, intellectual capital has become a source of fundamental transformation for socio-economic systems at various levels.

To improve the methodology for the application of intellectual capital in production, certain measures need to be implemented in management

practices. These include the following:

- Monitoring and forecasting of the external environment beyond production;
- Monitoring and forecasting of the internal environment in the production process, and determination of strategic objectives;
- Expert evaluation of development scenarios;
- Application of mathematical-economic models;
- Assessment of employee capabilities and motivation levels;
- Analysis of financial, organizational, and technical indicators;
- Analysis of the accuracy of results;
- Evaluation of market adaptability;
- Identification of strategic objectives and management tasks for the application of intellectual capital, and analysis of significant information obtained from forecasts;
- Formation of alternative strategies for applying intellectual capital in production;
- Development of goal-oriented criteria for the optimal strategy for the application of intellectual capital in production;
- Testing alternative strategies against established criteria;
- Selection of the optimal strategy.

CONCLUSION AND RECOMMENDATIONS:

In the modern era, amidst frequent economic turbulences in most countries, especially in economically developed nations, it has become a crucial issue to define the mechanisms for efficient management of a country's intellectual potential and intellectual capital. This is closely related to the fact that, in the current period, intangible assets and intellectual capital, as a significant component, are considered key sources of economic growth. It is important to note that the scale and quality of intellectual capital determine innovative development. It has already been universally accepted as an indisputable fact that, in the near future, the ability of countries to secure leadership positions will largely depend on the level of development of their intellectual capital.

To raise the level of intellectual capital in the Republic of Azerbaijan, to regenerate and update it, and to align quality standards with the demands of the era, a set of strategic and tactical measures aimed at both

short-term and long-term perspectives must be implemented by the state.

As seen, the process of forming intellectual capital takes place simultaneously with the formation of the individual. Human capital plays an active role in the formation of intellectual capital. To effectively influence this process, better organization of education and the teaching process, as well as proper supervision of the process, is required. With the use of specific mechanisms, goals can be more clearly defined, results can be assessed, and errors and inaccuracies can be corrected.

In this dissertation, a comprehensive study has been conducted on the aforementioned problems, and the key findings of this research are as follows:

- The characteristics of the workforce must be taken into account for the creation of intellectual capital, specifically the evaluation of the state of the enterprise's resources;
- Certain regulatory tools and mechanisms (tax incentives, investment and credit mechanisms) must be utilized;
- The scientific and scientific-pedagogical environment, along with mechanisms that create favorable conditions for fundamental and applied research, should be considered as directly linked to the formation and development of intellectual capital;
- Better organization of education and the teaching process, as well as proper supervision of the process, is required for the formation of intellectual capital;
- Increased investment in scientific and technical research and their application. This direction is complemented by various market infrastructures for innovation activities;
- The level of intellectual capabilities and the volume of accumulated knowledge should be aligned with the technological challenges of the era;
- To improve the methodology for the application of intellectual capital in production, the marketing and management of intellectual capital should be developed;
- The main financial burden of social programs falls on the state budget, and it would also be beneficial to establish a fund for the development of intellectual capital at both the national and regional levels;
- To improve the methodology for the application of intellectual capital in production, first and foremost, an optimal intellectual capital management

model must be developed.

The main provisions, findings, and recommendations of the dissertation have been reflected in the following published works:

1. R.Ş.Hüseynova. İntellektual kapitalın formalaşmasının nəzəri əsasları / AMEA İqtisadiyyat İnstitutu, Elmi əsərlər, III buraxılış, Bakı 2014, səh. 63-70
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4. Р.Ш.Гусейнова. Интеллектуальный капитал: аспекты развития понятия / «Экономика и предпринимательство», часть 2., Москва, 2015, №12, стр. 659-665.
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12. R.Huseynova. Influence of the digital education on the formation of human capital / International Conference Digital Economy: Modern Challenges and Real Opportunities UNEC - Baku / Azerbaijan 13-14 February 2020, pages 274-275.
13. R.Huseynova. Human Capital Management in Enterprises / 55th International Scientific Conference on Economic and Social Development was dedicated to Azerbaijan State University of Economics 90th Anniversary - Baku / Azerbaijan. 25 June 2020, pages 269-276.
14. R.Huseynova, A.Guliyeva, U.Rzayeva, G.Guliyeva. One Approach To Assessing The Intellectual Capital Of A Higher Educational Institution / 55th International Scientific Conference on Economic and Social Development was dedicated to Azerbaijan State University of Economics 90th Anniversary / Baku – Azerbaijan, 25 June 2020, pages 114-121.
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16. R.Huseynova. Analysis of the mechanism of intellectual capital formation and management in enterprises. 10th International Conference on Leadership, Technology, Innovation and Business

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17. R.Huseynova. Ways to increase the efficiency of methods and means of applying intellectual capital to production / International Black Sea Modern Scientific Research Congress. Rize, Turkiye September 29, 2022 - October 02, 2022, pages 86-87. https://www.izdas.org/blacksea
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20. R.Huseynova. İmpact of intellectual capital on regional development in the digital economy 2. INTERNATIONAL CONFERENCE ON ECONOMICS "Regional Development - Digital Economy", Baku, Azerbaijan December 21-23, 2023, pages 306-309. 614b1f_0ac1216c9fe345f59b6f9fcded0a5a0e.pdf (iksadkongre.com)

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