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Development of a knowledge economy model based on the application of digital technologies in the republic of Kazakhstan

Abstract

Object: the purpose of the study is to develop a model of the knowledge economy based on the use of digital technologies in the Republic of Kazakhstan. Research methods — questioning, survey, extrapolation, comparison.

Methods: the study was carried out in three stages. At the initial stage, primary data were collected, 6 questionnaires were developed, 147 people were interviewed.

Findings: the purpose of the study is to develop a model of the knowledge economy based on the use of digital technologies in the Republic of Kazakhstan. Research methods — questioning, survey, extrapolation, comparison. The main results of the study: the existing models of the development of the knowledge economy were studied, the main indicators of the knowledge economy in Kazakhstan and abroad were considered, it was revealed due to which measures taken foreign countries are leading in terms of knowledge economy indicators, forecast calculations of the main indicators of the knowledge economy were given, a model for the development of the knowledge economy was developed using digital technologies, which will increase the country's competitiveness and move to a new level of development and will contribute to the entry of the Republic of Kazakhstan into the top 30 most developed countries in the world.

Conclusions: without knowledge, the development of a post-industrial society is impossible. In this regard, a new knowledge-based economy stands out. The developed countries of the world have moved to a new development model — to the knowledge economy. To increase the competitiveness of the Republic of Kazakhstan, it is also necessary to move to a new stage of development — the knowledge economy. According to a number of indicators, the Republic of Kazakhstan lags behind other countries.

Key words: knowledge economy, digital technologies, knowledge, knowledge management.

Introduction

Currently, humanity has entered a phase of its development when knowledge becomes a key competitive advantage of an individual, organization, and society. In this regard, there are new requirements for rethinking the many new fast-growing processes and developing new effective measures. It becomes relevant not only to possess scientific knowledge, innovations and information, but also the ability to commercialize and turn this knowledge into competitive products. It is the “knowledge economy” that becomes a powerful impetus for accelerating technological development, increasing the knowledge intensity and competitiveness of products, contributing to the diversification of activities, helping to overcome depression and boost production in individual countries and their regions. In modern conditions, the Republic of Kazakhstan lags far behind in all indicators of the knowledge economy from highly developed countries. This indicates the problem of developing a knowledge-based economy.

The purpose of the study is to develop a model of the knowledge economy based on the use of digital technologies in the Republic of Kazakhstan. Scientific novelty — a model of the knowledge economy based on the use of digital technologies has been developed.

Literature review

The very first knowledge-based innovation models were linear innovation models. In the 1950s and 1960s, a linear model of innovation spreads; it is also called the first generation innovation process. The linear process consists of the following stages: fundamental, development work, design. There is also a linear

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innovation model, known as the traditional phase gate model. There are two versions of this model: the technology push or spurt model and the demand stimulation model (Becker, 1964).

Economists R. Barro and H. Sala-i-Martin proposed an econometric model of regional and national growth based on human capital (Barro, Sala-i-Martin, 1992). The peculiarity of this model is that it implies the absence of diminishing returns.

In 1980, theories of innovation systems were born, founded by C. Freeman (Freeman, 1987) and B. A Lündvall (1985). According to this theory, the effect of knowledge development depends on university cohesion and innovation.

The knowledge production function was introduced by Griliches (Griliches, 1979) and describes changes in the stock of knowledge in an economy or region and suggests a positive relationship between growth and stock of knowledge.

Pakes and Griliches (1984) further developed the original scheme for modeling the production function at the economy, region, and firm levels.

The spatial approach began to be applied in 1988 by L. Anselin (Anselin, 1988) and laid the foundation for the spatial econometrics of innovation and the knowledge economy at the country level, which makes it possible to explain the innovative activity of agglomerations. The modeling of spatial dependencies occurs through spatial autocorrelation. The weight matrix is used for accounting.

P. Romer built a model of the knowledge economy, according to which technological development depends on the total stock of capital in the economy (Romer, 1986). The model assumes that the knowledge of each country is a public good. The source of growth in the model is knowledge and learning by doing.

In 1992, the Mankiw-Romer-Weil (Mankiw et al., 1992) knowledge economy model was developed, which is an upgrade of the Solow-Swany model but takes into account human capital. This model is built in such a way that the better the country develops the greater the role played by the quality of human capital.

In 1999, American scientists Marie M. Crossan, Henry V. Line and Roderick E. White propose to use the knowledge model on the example of their behavior and consumption (Krugman, 1999).

P. Romer was awarded the Nobel Prize for “Integrating technological innovations into long-term macroeconomic analysis”, this theory laid the foundations for the theory of endogenous growth and predicted a significant impact of scientific ideas, spending on science on the country's economic growth (Romer, 1986). According to the Mankiw-Romer-Weil knowledge economy model, the more human capital develops, the better the country develops. Scientists H. Kramer and J. Reihoser built a knowledge management model consisting of 5 phases: 1) management of knowledge sources and information sources, 2) management of knowledge carriers and information resources, 3) knowledge supply management, 4) knowledge demand management, 5) infrastructure management of knowledge processing, information and communication (Panikarova, Vlasov, 2015).

Next, a model of the typology of knowledge capabilities appeared, which includes: the capabilities of the knowledge process and the capabilities of the knowledge infrastructure. The capabilities of the knowledge process include -3P +2Z- the acquisition, transformation, application and protection of knowledge. According to this model, the knowledge infrastructure depends on technology, organizational culture and structure (Rinne A., 2017.).

Komarovskaya Yu.Yu. (Komarovskaya, 2019) developed a knowledge management model, the main indicators of which are: goals, people, processes, technologies and abilities.

In the Republic of Kazakhstan, the model for the development of the knowledge economy based on labor and education was considered by Ramazanov A.A. (Ramazanov, 2011).

The development of a knowledge economy model based on a knowledge-intensive economy and knowledge-intensive industries was carried out by such scientists as Satybaldin A. A., Sagieva R. K., Zhuparova A. S. (Satybaldin et al., 2019).

Uskelenova A.T., Baidakov A.K., Seitzhanov S.S. identified factors influencing economic growth and the formation of a knowledge economy in the prism of economic growth models (Uskelenova et al., 2020).

The model of the influence of the knowledge economy on economic growth and development of regions is considered in their works by such scientists as: Spankulova L. S., Chulanova Z. K., Ibraimova S. Zh. (Spankulova et al., 2019).

Methods

The study was carried out in three stages. At the initial stage, primary data were collected, 6 questionnaires were developed. 147 people were interviewed (Fig. 1).

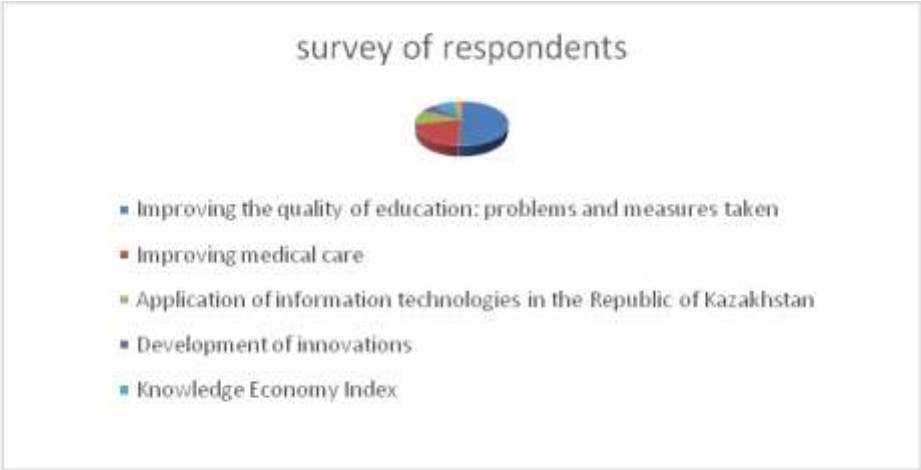

Figure 1. Survey of respondents on the main indicators of the knowledge economy

Note – compiled by the authors based on a survey of respondents.

The first questionnaire — "Improving the quality of education: problems and measures taken", 75 people aged 20 to 23 were interviewed, mostly students — undergraduates of Al-Farabi KazNU, the leading university in Kazakhstan, included in the QS 300 rating. The second questionnaire was "Improving medical care", it interviewed 30 people aged 20 to 50 years old, employees of medical institutions. The third questionnaire "Application of information technologies in the Republic of Kazakhstan", 15 people were interviewed — employees of IT departments, programmers. The fourth questionnaire — "Development of innovations", in which 10 entrepreneurs who have their own business were interviewed. The fifth questionnaire is the "Knowledge Economy Index", 12 people were interviewed, mainly employees of the akimat and civil servants. The sixth questionnaire — "Quality of life" interviewed 5 people, scientists from the Institute of Economics. The questionnaire data were carefully analyzed. At the second stage, based on statistical data, a comparative analysis of the development of the knowledge economy in Kazakhstan and abroad was carried out. 82 countries were analyzed in terms of indicators: knowledge index, knowledge economy index, health security index, human development index. The reasons for the success of the Scandinavian countries in building a knowledge economy are revealed. Next, the predictive indicators of the knowledge economy in the Republic of Kazakhstan are calculated using the extrapolation method.

At the third stage, based on primary and secondary data, a model of the knowledge economy for the Republic of Kazakhstan based on digital technologies was built. The application of this model will improve the main indicators of the knowledge economy, which will increase the competitiveness of the Republic of Kazakhstan and allow it to rise in world rankings.

Results

We believe that these indicators are not enough, they reflect the indicators of the knowledge economy at the country level. The results of our survey showed that the following indicators should be applied for the development of the knowledge economy: the level of development of science and education, the level of development of innovations and technologies, the use of information and communication technologies, i.e. knowledge index, knowledge economy index, health development, human development (Table 1).

Table 1. Analysis of the main indicators of the knowledge economy in foreign countries and the Republic of Kazakhstan in 2022

№	Countries	Knowledge Index		Knowledge Economy Index		Health Security Index		Human Development Index	
		2022	2023	2022	2023	2022	2023	2022	2023
1	Sweden	9.38	9,38	9.43	9.45	72.1	72.1	0,947	0,948
2	Finland	9.22	9,25	9.33	9.35	68.7	68.7	0,940	0,942

3	Denmark	9.00	9.00	9.16	9.19	70.4	71.2	0,948	0,950
4	Netherlands	8.99	8.99	9.11	9.11	75.6	75.6	0,941	0,941
5	Norway	8.99	8.99	9.11	9.11	64.6	64.6	0,961	0,961
6	New Zealand	8.93	8.93	8.97	8.97	54.0	54.0	0,937	0,937
7	Canada	8.72	9.00	8.92	8.92	75.3	75.3	0,936	0,936
8	Germany	8.83	8.89	8.90	8.90	66.0	66.0	0,942	0,942
9	Australia	8.98	8.98	8.88	8.89	75.5	75.5	0,951	0,951
10	Switzerland	8.65	8.65	8.87	8.80	67.0	67.0	0,962	0,962
11	Ireland	8.73	8.73	8.86	8.87	59.0	59.0	0,945	0,945
12	USA	8.89	9.00	8.77	8.78	83.5	83.5	0,925	0,925
13	Taiwan	9.10	9.10	8.77	8.79	53.0	53.0	0,921	0,921
14	Great Britain	8.61	8.61	8.76	8.77	77.9	77.9	0,929	0,929
15	Belgium	8.68	8.68	8.71	8.72	61.0	61.0	0,937	0,937
16	Iceland	8.54	8.54	8.62	8.63	65.9	65.9	0,876	0,876
17	Austria	8.39	8.39	8.61	8.62	58.5	58.5	0,916	0,916
18	Hong Kong	8.17	8.17	8.52	8.52	52.0	52.0	0,699	0,699
19	Estonia	8.26	8.26	8.40	8.40	57.0	57.0	0,890	0,890
20	Luxembourg	8.01	8.01	8.37	8.37	56.0	56.0	0,930	0,930
21	Spain	8.26	8.30	8.35	8.35	55.0	55.0	0,905	0,905
22	Japan	8.53	8.53	8.28	8.28	59.8	60.0	0,800	0,801
23	Singapore	7.79	7.79	8.26	8.26	58.7	58.7	0,939	0,940
24	France	8.36	8.36	8.21	8.21	68.2	68.2	0,903	0,903
25	Israel	8.07	8.07	8.14	8.14	64.8	64.8	0,919	0,919
26	Czech	8.00	8.00	8.14	8.14	52.0	52.0	0,889	0,889
27	Hungary	7.93	7.95	8.02	8.02	50.3	50.3	0,887	0,887
28	Slovenia	7.91	7.92	8.01	8.01	67.2	67.2	0,918	0,918
29	South Korea	8.65	8.70	7.97	7.97	70.2	70.2	0,925	0,925
30	Italy	7.94	7.94	7.89	7.89	56.2	57.2	0,887	0,887
31	Malta	7.53	7.53	7.88	7.89	67.4	67.5	0,918	0,918
32	Latvia	7.68	7.68	7.80	7.82	62.9	62.9	0,863	0,863
33	Slovakia	7.46	7.46	7.64	7.65	61.2	61.2	0,988	0,988
34	Portugal	7.34	7.34	7.61	7.62	60.3	60.3	0,866	0,866
35	Cyprus	7.50	7.50	7.56	7.57	51.2	51.2	0,896	0,896
36	Greece	7.74	7.74	7.51	7.52	52.3	52.3	0,878	0,878
37	Lithuania	7.15	7.15	7.41	7.42	55.0	55.0	0,875	0,875
38	Poland	7.20	7.20	7.41	7.41	55.4	55.4	0,876	0,876
39	Croatia	7.27	7.27	7.29	7.29	53.3	53.3	0,782	0,782
40	Chile	6.61	6.61	7.21	7.21	58.3	60.0	0,768	0,768
41	Barbados	7.92	7.92	7.18	7.18	30.2	30.2	0,878	0,878
42	United Arab Emirates	7.09	7.15	6.94	6.94	33.1	33.1	0,911	0,912
43	Bahrain	6.98	6.98	6.90	6.90	34.2	34.2	0,876	0,876
44	Romania	6.63	6.63	6.82	6.82	43.2	43.2	0,767	0,767
45	Bulgaria	6.61	6.61	6.80	6.80	41.2	41.2	0,691	0,691
46	Uruguay	6.32	6.32	6.39	6.39	59.3	59.3	0,683	0,683
47	Oman	5.87	5.87	6.14	6.14	60.0	60.0	0,998	0,998
48	Malaysia	6.25	6.25	6.10	6.10	62.2	62.2	0,45	0,45
49	Serbia	6.61	6.61	6.02	6.02	52.3	52.3	0,683	0,683
50	Saudi Arabia	6.05	6.05	5.96	5.96	50.2	50.2	0,875	0,875
51	Costa Rica	5.65	5.65	5.93	5.93	51.2	52.2	0,987	0,987
52	Trinidad and Tobago	5.93	5.93	5.91	5.91	50.9	50.9	0,876	0,876
53	Aruba	4.97	4.97	5.89	5.89	51.2	51.2	0,587	0,587
54	Qatar	5.50	5.50	5.84	5.84	50.1	50.1	0,876	0,876
55	Russia	6.96	6.96	5.78	5.78	44.3	44.3	0,822	0,822
56	Ukraine	6.33	6.33	5.73	5.73	19.9	19.9	0,773	0,773
57	Macedonia	5.63	5.63	5.65	5.65	44.3	44.3	0,598	0,60
58	Jamaica	6.18	6.18	5.65	5.65	16.2	16.2	0,598	0,598
59	Belarus	6.62	6.62	5.59	5.59	35.3	35.3	0,808	0,808

60	Brazil	6.05	6.05	5.58	5.58	59.7	59.7	0,754	0,754
61	Dominica	5.50	5.50	5.56	5.56	24.0	24.0	0,567	0,567
62	Mauritius	4.62	4.62	5.52	5.52	27.5	27.5	0,639	0,639
63	Argentina	6.54	6.54	5.43	5.43	58.6	59.0	0,589	0,589
64	Kuwait	5.15	5.15	5.33	5.33	46.1	46.1	0,568	0,568
65	Panama	5.32	5.32	5.30	5.30	19,4	19,4	0,789	0,789
66	Thailand	5.25	5.25	5.21	5.21	73.2	73.2	0,639	0,639
67	South Africa	5.11	5.11	5.21	5.21	54.8	54.8	0,553	0,553
68	Georgia	4.49	4.49	5.19	5.19	52.0	52.0	0,639	0,639
69	Türkiye	4.81	4.81	5.16	5.16	52.4	52.4	0,855	0,855
70	Bosnia and Herzegovina	4.97	4.97	5.12	5.12	42.8	42.8	0,639	0,639
71	Armenia	4.84	4.84	5.08	5.08	50.2	50.2	0,639	0,639
72	Mexico	5.13	5.13	5.07	5.07	57.6	58.1	0,639	0,741
73	Kazakhstan	5.40	5.40	5.04	5.04	40.7	40.7	0,811	0,812
Note – developed by the authors on the basis of statistical data									

As can be seen, among 82 countries, the Republic of Kazakhstan lags behind in all indicators. According to the knowledge index and the knowledge index, the health security index and the human development index, Kazakhstan is in 73rd place. As can be seen from Table 1, Sweden leads in terms of the knowledge index, the knowledge economy index due to the introduction of innovations, significant funding for scientific research and the use of digital technologies. Finland ranks second in the knowledge index, the knowledge economy index. It has such high performance due to the development of information technology. The use of the Internet is more common in Finland than in the EU average (e-banking and the use of digital technologies in business are developed). Finland has especially advanced in the use of cloud programming, as well as in the creation of artificial intelligence, which is one of the most relevant and discussed technologies in 2023. The "National Program for the Development of Artificial Intelligence" was adopted, which aims to achieve leadership in its use (European Commission, 2022). This makes it possible to create and strengthen chains of links between companies and some government organizations, as well as universities, research institutes, etc. Thirdly, to develop information and digital technologies that provide a breakthrough in development.

Forecast calculations of the main indicators of the knowledge economy in the Republic of Kazakhstan are given.

If we consider the overall indicators of the knowledge economy in the Republic of Kazakhstan, they are very low (Table 2).

Table 2. Forecast of key indicators of the knowledge economy for 2024

№	Countries	Knowledge Index	Knowledge Economy Index	Health Security Index	Human Development Index
1	Sweden	9,38	14.55	72.1	0,944
2	Finland	9,23	9.34	68.7	0,941
3	Denmark	9.00	9.19	70,8	0,949
4	Netherlands	8.99	9.11	75.6	0,941
5	Norway	8.99	9.11	64.6	0,961
6	New Zealand	8.93	8.97	54.0	0,937
7	Canada	8,86	8.92	75.3	0,936
8	Germany	13,27	8.90	66.0	0,942
9	Australia	8.98	8.85	75.5	0,951
10	Switzerland	8.65	13.27	67.0	0,962
11	Ireland	8.73	13.29	59.0	0,945
12	USA	8,94	13.20	83.5	0,925
13	Taiwan	9.10	13.65	53.0	0,921
14	Great Britain	8.61	13.14	77.9	0,929
15	Belgium	8.68	8.72	61.0	0,937
16	Iceland	8.54	12.93	65.9	0,876
17	Austria	8.39	8.65	58.5	0,916

18	Hong Kong	8.17	8.52	52.0	0,699
19	Estonia	8.26	8.40	57.0	0,890
20	Luxembourg	8.01	8.37	56.0	0,930
21	Spain	12,41	8.35	55.0	0,905
22	Japan	8.53	8.28	59.9	0,805
23	Singapore	7.79	8.26	58.7	0,940
24	France	8.36	8.21	68.2	0,903
25	Israel	8.07	8.14	64.8	0,919
26	Czech	8.00	8.14	52.0	0,889
27	Hungary	7.95	8.02	50.3	0,887
28	Slovenia	7.92	8.01	67.2	0,918
29	South Korea	13	7.97	70.2	0,925
30	Italy	7.94	7.89	56.7	0,887
31	Malta	7.53	11.82	67.5	0,918
32	Latvia	7.68	11.71	62.9	0,863
33	Slovakia	7.46	11.46	61.2	0,988
34	Portugal	7.34	7.61	60.3	0,866
35	Cyprus	7.50	7.56	51.2	0,896
36	Greece	7.74	11.27	52.3	0,878
37	Lithuania	7.15	7.45	55.0	0,875
38	Poland	7.20	7.41	55.4	0,876
39	Croatia	7.27	7.29	53.3	0,782
40	Chile	6.61	7.21	59.15	0,768
41	Barbados	7.92	7.18	30.2	0,878
42	United Arab Emirates	7.12	6.94	33.1	0,915
43	Bahrain	6.98	6.90	34.2	0,876
44	Romania	6.63	6.82	43.2	0,767
45	Bulgaria	6.61	6.80	41.2	0,691
46	Uruguay	6.32	6.39	59.3	0,683
47	Oman	5.87	6.14	60.0	0,998
48	Malaysia	6.25	6.10	62.2	0,45
49	Serbia	6.61	6.02	52.3	0,683
50	Saudi Arabia	6.05	5.96	50.2	0,875
51	Costa Rica	5.65	5.93	51.7	0,987
52	Trinidad and Tobago	5.93	5.91	50.9	0,876
53	Aruba	4.97	5.89	51.2	0,587
54	Qatar	5.50	5.84	50.1	0,876
55	Russia	6.96	5.78	44.3	0,822
56	Ukraine	6.33	5.73	19.9	0,773
57	Macedonia	5.63	5.65	44.3	0,595
58	Jamaica	6.18	5.65	16.2	0,598
59	Belarus	6.62	5.59	35.3	0,808
60	Brazil	6.05	5.58	59.7	0,754
61	Dominica	5.50	5.56	24.0	0,567
62	Mauritius	4.62	5.52	27.5	0,639
63	Argentina	6.54	5.43	58.8	0,589
64	Kuwait	5.15	5.33	46.1	0,568
65	Panama	5.32	5.30	19,4	0,789
66	Thailand	5.25	5.21	73.2	0,639
67	South Africa	5.11	5.21	54.8	0,553
68	Georgia	4.49	5.19	52.0	0,639
69	Türkiye	4.81	5.16	52.4	0,855
70	Bosnia and Herzegovina	4.97	5.12	42.8	0,639
71	Armenia	4.84	5.08	50.2	0,639
72	Mexico	5.13	5.07	57.85	0,370
73	Kazakhstan	5.40	5.04	40.7	0,815

Note – Developed by the authors on the basis of statistical data

Forecast calculations show that, if no measures are taken, all indicators of the knowledge economy in the field of science and education, the level of development of innovations and technologies, the use of information and communication technologies, the knowledge index, the knowledge economy index, healthcare development and human development in the Republic of Kazakhstan will remain at the same level and in all ratings in the knowledge economy, Kazakhstan will occupy the last places. Therefore, based on the experience of developed countries, it is necessary to develop our own model of the knowledge economy.

A model for the development of the knowledge economy using digital technologies has been developed**.**

The low indicator of the knowledge economy indicates a weak government regulation of the knowledge economy. The analysis carried out revealed the need to include such components as planning, forecasting, regulatory legal acts in the model for the development of the knowledge economy, and digital technologies must be included. Thus, for the development of the knowledge economy at the country level, active state regulation is necessary (Fig. 2).

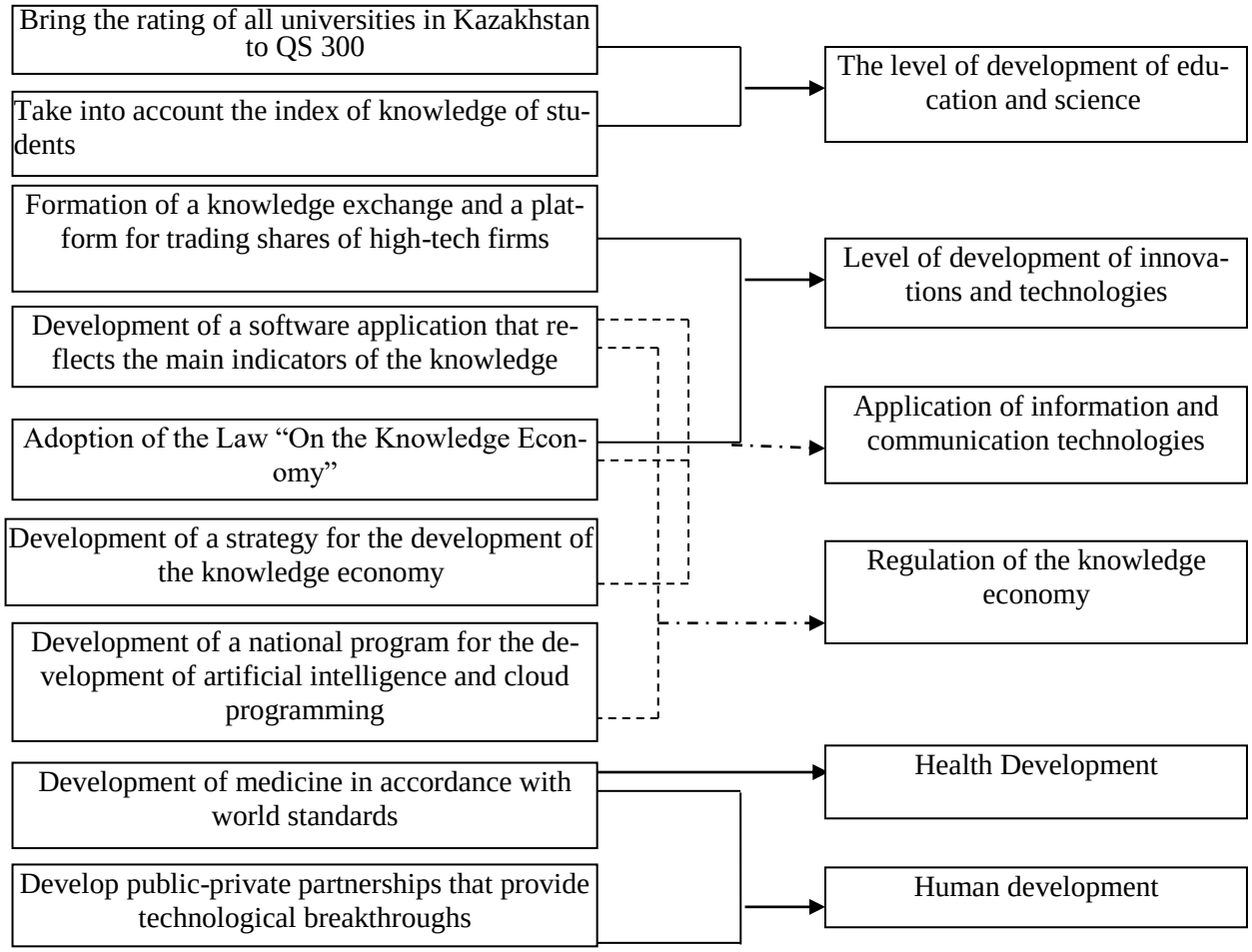

Figure 2. Model of the development of the knowledge economy at the state level

Note – developed by the authors

This model includes the following elements that contribute to the development of the knowledge economy:

1) in the field of education and science:

a) bring the ranking of all universities in Kazakhstan to QS 300, using the principle of the triple helix and the development of world-class schools,

b) measure the quality of knowledge — by the index of students' knowledge, with the help of which it is possible to predict the development of the student in the future and conduct a comparative analysis.

Discussions

The knowledge index of students will be assessed by the Ministry of Education on a quarterly basis and analyze trends in its change:

Students' knowledge index = Satisfaction with the quality of education + Acquisition of new knowledge + Application of new knowledge.

The constant calculation of this index will allow to raise the level of education and the knowledge economy index.

1) in terms of the level of development of innovations and technologies — the formation of a knowledge exchange and a platform for trading shares of high-tech firms,

2) in terms of the level of application of information and communication technologies — the development of a software application that reflects the main indicators of the knowledge economy,

The proposed model has a number of advantages: testing it will improve the quality of life, increase the level of human development, improve the quality of education and medical services based on the developed software, strengthen control through the creation of a special subordinate body to regulate knowledge economy issues. This model describes the impact on the knowledge economy not only of costs and technological innovations, but also takes into account planning, forecasting, regulations and digital technologies.

Conclusions

It is the "knowledge economy" that becomes a powerful impetus for accelerating technological development, increasing science-intensive and competitiveness of products, contributing to the diversification of activities, helping to overcome depression and boost production in individual countries and their regions. Half of all the information that a person uses in the modern world has been obtained over the past 15 years. The global amount of information doubles every 7 years. The dynamics of the economic growth of an enterprise, country and region is largely determined by investments in science and human capital. Thus, the choice of a knowledge economy model depends on many parameters: market infrastructure, industry affiliation, organizational form, firm size. In turn, knowledge began to play an ever-increasing role. The study notes that the Republic of Kazakhstan lags far behind other countries in all indicators characteristic of a knowledge economy. In order to solve the problem, it is necessary to switch to a new model of the knowledge economy at the state level. The application of this model will raise all key indicators of the knowledge economy: education, information technology, innovation, knowledge index, knowledge economy index, indicators of health security and human capital development.

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References

(2022). European Commission. A European approach to artificial intelligence Retrieved from https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence

Anselin, L. (1988). Spatial Econometrics: Methods and Models. Dordrecht: Kluwer Academic. DOI:10.13140/RG.2.2.26447.20641

Barro, R., & Sala-i-Martin, H. (1992). Convergence. *Journal of Political Economy*, 2, 223–251.

Becker, G.S. (1964). *Human Capital: A Theoretical and Empirical Analysis.* Retrieved from https://www.nber.org/books-and-chapters/human-capital-theoretical-and-empirical-analysis-special-reference-education-first-edition

Freeman, C. (1987). *Technology Policy and Economic Performance: Lessons from Japan.* Retrieved from https://www.amazon.com/Technology-Policy-Economic-Performance-Lessons/dp/0861879287

Global Health Security Index. Retrieved from https://nonews.co/directory/lists/countries/global-health-security-index

Griliches, Z. (1979). Issues in assessing the contribution of research and development to productivity growth. *The Bell Journal of Economics, 10* (1), 92–116.

Komarovskaya, Y.Y. (2019). Optimization of knowledge and information exchange in the study of the effectiveness of the quality management system of an enterprise. *Business Strategy, 8* (64), 23-34.

Krugman, P. (1999). Development, geography, and economic theory. Cambridge, Massachusetts: 300.

Lündvall, B.-Å. (1985). *Product Innovation and User-Producer Interaction. Industrial Development, Research Series. Aalborg: Aalborg University Press, 40.* Retrieved from https://vbn.aau.dk/ws/portalfiles/portal/7556474/user-producer.pdf

Mankiw, G., & Romer, D., Weil, D. (1992). A contribution to the empirics of economic growth. *The Quarterly Journal of Economics, 107* (2), 407–437.

Pakes, A., & Griliches, Z. (1984). *Patents and R&D at the Firm Level: A First Look.* University of Chicago Press.

Panikarova, S.V., & Vlasov, M.V. (2015). Knowledge and intellectual capital management. DOI:10.14419/ijet.v7i3.19.16997.
Ramazanov, A. A. (2011). Economics of knowledge. DOI:10.5829/idosi.wasj.2013.27.emf.39
Rating of countries of the world according to the knowledge economy index. Retrieved from //https://gtmarket.ru/ratings/knowledge-economy-index
Rating of the quality of life in the countries of the world. Retrieved from https://gtmarket.ru/ratings/quality-of-life-index.
Rinne, A. (2017). What Exactly is the Sharing Economy? World Economic Forum, 13 December. Retrieved from www.weforum.org/agenda/2017/12/when-is-sharing-not-really-sharing.
Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of Political economy, 94* (5), 1002–1037.
Satybaldin, A. A., Sagieva, R. K., & Zhuparova, A. S. (2019). Problems and prospects for the development of high-tech industries in the Republic of Kazakhstan. *Journal Economics: the strategy and practice, 14* (2), 9-24.
Spankulova, L. S., Chulanova, Z. K., & Ibraimova, S. Zh (2019). Influence of innovation activity, human capital, knowledge flow on the economic growth of regions. *Journal Economics: strategy and practice, 4* (14), 53-64.
Uskelenova, A. T., Baidakov, A. K., & Seitzhanov, S. S. (2020). Factors in the formation of the "knowledge economy" in the prism of economic growth models. *Scientific journal* Bulletin of the University Turan, *1* (85), 231-235.

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Цифрлық технологияларды пайдалану негізінде білім экономикасының моделін әзірлеу

Аңдатпа:

Мақсаты: Қазақстан Республикасында цифрлық технологияларды қолдану негізінде білім экономикасының моделін жасау.

Әдісі: Сұрау, сауалнама, экстраполяция, салыстыру.

Қорытынды: Білім экономикасын дамытудың қолданыстағы модельдері зерделенді, Қазақстандағы және шетелдегі білім экономикасының негізгі көрсеткіштері қаралды, қабылданатын шаралар есебінен шет елдердегі экономика көрсеткіштерінің білім деңгейі бойынша көшбасшы екені анықталды, білім экономикасының негізгі көрсеткіштерінің болжамды есептеулері келтірілді, цифрлық технологияларды пайдалана отырып, білім экономикасын дамыту моделі әзірленді, бұл елдің бәсекеге қабілеттілігін арттырады және дамудың жаңа деңгейіне көшеді, сонымен қатар Қазақстан Республикасының әлемнің неғұрлым дамыған 30 елінің қатарына кіруіне ықпал ететін болады.

Тұжырымдама: Білімсіз постиндустриалды қоғамның дамуы мүмкін емес. Осыған байланысты білімге негізделген жаңа экономика ерекшеленеді. Әлемнің дамыған елдері дамудың жаңа моделіне, яғни білім экономикасына көшті. Қазақстан Республикасының бәсекеге қабілеттілігін арттыру үшін дамудың жаңа кезеңіне — білім экономикасына көшу қажет. Бірқатар көрсеткіштер бойынша Қазақстан Республикасы басқа елдерден артта қалып отыр.

Кілт сөздер: білім экономикасы, цифрлық технологиялар, білім, біліммен басқару.

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Развитие модели экономики знаний на основе применения цифровых технологий

Аннотация:

Цель исследования заключается в разработке модели экономики знаний на основе использования цифровых технологий в Республике Казахстан.

Методы: Анкетирование, опрос, экстраполяция, сравнение.

Результаты исследования: Изучены существующие модели развития экономики знаний, рассмотрены основные показатели экономики знаний в Казахстане и за рубежом, выявлено, за счет каких принимаемых мер зарубежные страны лидируют по уровню знаний показателей экономики, приведены прогнозные расчеты основных показателей экономики знаний, разработана модель развития экономики знаний с использованием цифровых технологий, что повысит конкурентоспособность страны и перейдет на новый уровень развития и будет способствовать вхождению Республики Казахстан в число 30 наиболее развитых стран мира.

Выводы: Без знаний невозможно развитие постиндустриального общества. В этом отношении выделяется новая экономика, основанная на знаниях. Развитые страны мира перешли к новой модели развития — к экономике знаний. Для повышения конкурентоспособности Республики Казахстан также необходимо перейти на новый этап развития — экономику знаний. По ряду показателей Республика Казахстан отстает от других стран.

Ключевые слова: экономика знаний, цифровые технологии, знания, управление знаниями, новый уровень развития, цифровые технологии.