

**FACTORS OF HUMAN CAPITAL MODERNIZATION IN THE CONTEXT OF
INSTITUTIONALIZATION OF INFORMATION ECONOMY**

Maryna Radieva and Viktoriia Kolomiets

Abstract. The constant institutional transformations of society make it necessary to study their influence on the development of human capital and the dependence of the development of human capital on the conditions of institutionalization of the information economy. The aim of this scientific work: to identify the existence of a dependence of the development of human capital on the institutionalization of society in the information economy, to build correlation-regression models of the dependence of the development of human capital on the level of development of the country's institutional system in the information economy. The study has proved the hypothesis that there is a relationship between the human capital index and the development of the country's institutional system. The selection of indicators describing the dependence of the development of human capital on the development of the country's institutional system in the information economy, which included political, legal, economic, social, institutional, using an expert analysis method, is carried out. For a multifactorial phenomenon, as the dependence of the development of human capital on the level of development of the country's institutional system in the information economy, the methods of multiple correlation and regression analysis are used. The study was conducted for 157 countries of the world for which the World Bank determined the country's human capital index in 2018. As a result, correlation equations are constructed that give the dependence of the development of human capital on the level of development of the country's institutional system in the information economy. They should determine the feasibility of material costs for the development of a separate factor of the influence of the institutional system for the development of human capital. The constructed models have shown that the greatest correlation between the human capital index and the selected indicators of the country's institutional system development exists: for countries with a high human capital index and high gross national income per capita – government labor costs, tax burden; for countries with an average human capital index and with an average gross national income per capita, to which Ukraine belongs, – freedom of the labor market, protection of property rights; for countries with a low human capital index and low gross national income per capita – effectiveness of the judicial system, government decency. The study of the dependence of the development of human capital on the development of the institutional system will interest not only the scientific layers of countries, but also state and government institutions.

Keywords: human capital, human capital index, institutionalization, institutional system, information economy

JEL Classification: E02, E14, E24

Authors:**Maryna Radieva**

Melitopol Institute of Public And Municipal Administration of the Classic Private University, 8/2, Kakhovske shose, Zaporizka Region, Melitopol, Ukraine, 72311

E-mail: ra_va@ukr.net

<https://orcid.org/0000-0003-2288-3388>

Viktorii Kolomiets

Melitopol Institute of Public And Municipal Administration of the Classic Private University, 8/2, Kakhovske shose, Zaporizka Region, Melitopol, Ukraine, 72311

E-mail: vik2005vik@meta.ua

<https://orcid.org/0000-0003-3427-8986>

Citation: Radieva, M., & Kolomiets, V. (2019). Factors of human capital modernization in the context of institutionalization of information economy. *Virtual Economics*, 2(4), 26-45. [https://doi.org/10.34021/ve.2019.02.04\(2\)](https://doi.org/10.34021/ve.2019.02.04(2))

Received: July 19, 2019. Revised: August 3, 2019. Accepted: August 23, 2019.

© Author(s) 2019. Licensed under the [Creative Commons License - Attribution 4.0 International \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/)

1. Introduction

The information economy is based on human capital. It is from the creativity and creative achievements of a person that the development of the latest technologies, technological and social progress of society depends. It should also be noted that all the achievements of mankind are aimed at satisfying the diverse needs of man as a single object and human capital. Thus, human capital in the information economy acts as a consumer of goods and as a resource, without which it is impossible to imagine the development of society.

The institutionalization of the country's environment, as a process of determining and fixing norms, contributes to the development of human capital, helps individuals to feel comfortable in an institutional society, and allows the country to function exclusively in accordance with constitutional norms and rules. But in the context of the dynamic development of the information economy, the influence of the institutional environment on a person, its well-being, and the development of human capital are not considered enough. It is necessary to study the feasibility and significance of the influence of the institutional environment on the development of human capital.

The aim of this scientific work: to identify the existence of a dependence of the development of human capital on the institutionalization of society in the information economy, to build correlation-regression models of the dependence of the development of human capital on the level of development of the country's institutional system in the information economy.

The development of these correlation-regression models will make it possible to calculate the economic feasibility of material investments in the development of individual components of the institutional system for the development of the country's human capital.

2. Literature review

In the hierarchy of research, human capital is at the top of the information economy. Significant results in the study of various aspects of human capital achieved by scientists G. Becker, N. Bhutoria, B. Weisberg, L. Gratton, J. Mincer, L. Turou, T. Schulz.

Human capital is defined as a key result of the development of human resources (Ali et al., 2018; Bryukhovetska & Chornaya, 2015; Kolomiets & Golovkova, 2017; Dalevska et al., 2019; Mahmood & Alkahtani, 2018; Siddiqui & Rehman, 2016; Liashenko, 2016; Flamholtz et al., 2002). A number of scientists are inclined towards the need for investments in the development of human resources in order to develop and maintain them in the future and preserve them in the present (Bryukhovetska & Chornaya, 2015; Kolomiets & Golovkova, 2017; Kwilinski et al., 2019; Pajak et al., 2016; Liashenko & Pidorycheva, 2019; Radieva, 2018). At the same time, it is recognized that human capital stimulates and ensures the formation of the economic viability of a person, enterprise, and state (Liashenko, 2017; Radieva, 2018).

The conceptual definition of human capital is the subject of research by G. Becker (1964). He aligned theoretical studies with practical results that established a positive correlation between the incomes of individuals and their level of education, employment, and duration of study (Becker, 1964).

Many researchers have studied the question of what factors and factors affect human capital. The search for a connection between human capital and the country's economic growth was carried out by M. Ali, A. Egbetokun et M. Memon (2018). They emphasize that the main factors influencing human capital are economic and institutional indicators and draw conclusions from empirical studies (Ali et al., 2018). The theoretical formulations of the relationship between human capital and a country's growth consistently suggest that the knowledge embodied in a person is important for innovation, productivity and dynamic growth (Ali et al., 2018).

N. Mahmood et N. Alkahtani (2018), based on data for the period 1970-2017, and also by applying a regression model with a distributed lag, investigate the impact of human resources and the development of the financial market on the country's economic growth. The results of the study show that the interaction of human capital and human resources, as well as capital and the financial market, has a positive effect on economic growth (Mahmood & Alkahtani, 2018).

Studies of A. Siddiqui et A. Rehman (2016) are devoted to regional features of the development of human capital. They study what factors ensure the different development of human capital and emphasize the importance of spending on education and maintaining the health of human capital. The importance of human capital for regional development, its impact

on economic development is noted not only for individual countries, but also for entire regions and locations (Lyashenko, 2017).

V. Lyashenko et I. Pidorycheva (2019) note that the main source of economic growth and industrial development for developing countries is their absorption capacity or ability to use world knowledge and technology. The main ones are foreign direct investment, trade, research and development, codified knowledge flows and human capital.

A review of literary sources shows that scientific studies of the dependence of the development of human capital in the information economy are focused on the manifestation of the influence of exclusively economic factors or the correlation between the growth of human capital and economic growth of the country. The influence of the institutional system on human capital remains without the attention of scientists. Meanwhile, in the conditions of informatization of society, it is institutionalization that can give a general synergistic effect in politics, economics, and the social sphere and lead to the rapid development of human capital.

Institutional theory is based in the works of T. Veblen, developed by J. Commons, W. Mitchell, J. Gelbraith. The founders of the modern theory of institutionalism consider R. Coase, D. North. Institutionalization of a country is an ongoing process. Intensive institutional transformations that determine the development of countries with economies in transition guide the vector of change in all areas. At the same time, human capital is limited in its actions by the institutional structure of society (Radiyeva, 2018). Institutional changes lead to the emergence of new and the withering away of old rules of behavior and appropriate mechanisms to ensure their transformation (Tkach et al., 2018). There are also changes in the structure and nature of economic relations within the framework of the existing rules for their participants. Such an approach to the determination of institutional changes takes into account that the current rules mean not only the emergence of new attitudes, but also new mechanisms that ensure their compliance with entities (Tkach et al., 2018).

Along with the positive effects of institutionalization, other consequences are noted. Among the many negative factors, the main ones are the weakness of the government, political instability, the judicial system, the right to apply contract rights and the low level of development of the institution of property rights, which in general can indicate an institutional crisis in the country (Shashyna, 2018).

The influence of the institutional environment is manifested as formed under the influence of a certain institutional system of human capital and its actual ability to produce the gross product and use it effectively (or inefficiently) to manage human capital.

The constant institutional transformations of society make it necessary to study their influence on the development of human capital and the dependence of the development of human capital on institutionalization, especially in the context of the information economy.

3. Methods

The methodological basis of the study is the fundamental principles of economic theory, the development of information economy, institutional theory, presented in classical and modern scientific works of scientists on human capital and human resource management, economic development, institutionalists.

To achieve this goal and solve certain problems, let's use a set of scientific methods that ensure the conceptual integrity of the study, in particular: structural-logical analysis and generalization – for the logical structural construction of the work; economic-statistical and comparative analysis – for identification of the dynamics, level of development of human capital, establishing the dependence of the development of human capital and the institutional system of the country; grouping and systematization - for ranking countries according to the GNI level, identifying factors of influence on human capital, statistical and mathematical methods (multivariate correlation and regression analysis) – for building economic and mathematical models of the dependence of the human capital index on the level of institutional development of the country.

Measuring the dependence of the development of human capital on the institutionalization of society in the context of the information economy is quite difficult. Practical measurements at the individual, collective, regional, national levels require the construction of a number of indicators. It is even more difficult to develop a methodology for measuring the dependence of human capital on the level of institutional development of a country. Separate methods require comparing studies between people, organizations, and states.

4. Results and Discussion

The information economy has contributed to a shift in emphasis closer to the consumer market, where consumer awareness and demand have increased. This has led to a shorter life cycle of products and services, making innovation and differentiation of products and technologies critical to competitiveness. Existing indicators and tools have lost the ability to provide a comprehensive and sufficient picture of the country's effectiveness and status. There were no specific values, quantitative and qualitative descriptions (which existed, for example, for equipment, stocks) of human capital of the country's economy. The measurement of the dependence of the development of human capital on various factors has become a problem when trying to find an acceptable form and criteria for determination.

In general, various dimensions of human capital are the process of identifying, defining, measuring, and sharing information on the importance of human capital for decision making (Roslender, 2009).

When determining the dependence of the development of human capital on various factors, it should be borne in mind that human capital, in appearance, is invisible and closely related to

the place, time and purpose, as well as the degree of protection of intellectual property, own developments (patents, licenses, know-how), legal documents on them.

Theoretical studies provided the basis for determining indicators describing the influence of factors on the development of human capital, and their grouping is shown in *Table 1*.

Table 1. Indicators of factors of influence on the development of human capital of the national economy by groups

Groups	Indicators of factors		
Political and legal factors	Regulatory policy	Corruption level	Bureaucracy level
	Trade and economic policy	Law enforcement effectiveness	Level of compliance with laws
Economic factors	GNI per capita	Investment rate	Minimum wage
	Consumer price level	Unemployment rate	Labor migration rate
Social factors	Birth rate	Mortality rate	Healthcare costs
	Culture expenses	Environmental performance index	Pension replacement rate
Organizational and administrative and information and communication factors	Country competitiveness index	Employee competitiveness	Access to the Internet
	Computer software	Access to communication systems	Provision of communication systems
Scientific and technological factors	Number of new technologies	Innovation costs	Science expenses
	Research costs	Energy saving costs	Intellectual property protection
Institutional factors	Business freedom	Labor market freedom	Monetary freedom
	Freedom of trade	Freedom of investment	Financial freedom
	Fiscal health	Government spending	Tax burden
	Government decency	Judiciary effectiveness	Protection of property rights

Source: own research.

The group of political and legal indicators includes: regulatory policy, corruption level, bureaucracy level, trade and economic policy. The group of economic indicators includes unemployment, investment, minimum wage, consumer price level. The group of social indicators includes the birth rate, mortality rate, health care costs, cultural expenses, environmental performance index, pension replacement rate, labor migration rate, gender equality.

An acceptable measurement of human capital can be based on an equation where the cost of an employee's labor, wages, and other benefits will be proportional to economic benefits, such

as turnover or gross profit. But this approach does not take into account the opportunities created by human capital for developing a business or measuring the benefits of developing practices and processes. A common problem is to measure the value of hidden values: how much hidden factors of creating the value of human capital, such as rare skills, unique knowledge, skills, social skills, implicit knowledge, could be better used for the development of the country if they are recognized and discovered.

The study hypothesizes that there is a relationship between the human capital index and the development of the country's institutional system.

The selection of indicators describing the dependence of the development of human capital on the development of the institutional system of the country, which includes political, legal, economic, social, institutional, using an expert method of analysis, is carried out.

When calculating the reliability of these indicators, the Cronbach's alpha coefficient value of 0.78 is obtained, which confirms the consistency of the characteristics within the group and the possibility of combining them into a single group. The relationship between the indicators shows that the variance between them is at an acceptable level in the range of 0.25-0.55.

The Cronbach's alpha coefficient shows the internal consistency of characteristics describing a single object, but is not an indicator of the homogeneity of an object. The coefficient is often used in expert assessments when building tests and to test their reliability.

The standardized Cronbach's alpha coefficient is calculated by the formula:

$$a_{st} = N \times \hat{r}, \quad (1)$$

where N – the number of investigated components;

\hat{r} – the average correlation coefficient between the components.

Cronbach's alpha can take the values: > 0.5 - low consistency, > 0.6 – doubtful consistency, > 0.7 – sufficient consistency, > 0.8 – good consistency, > 0.9 – very good consistency.

For multifactorial models or phenomena, which is the dependence of the development of human capital on the level of development of the country's institutional system in the context of the information economy, it is advisable to use methods of multiple correlation and regression analysis, which allow to study and quantify the internal and external investigative relationships between the factors forming the model and establish patterns functioning and development trends of the investigated effective trait. In a real economy, probabilities (stochastic) relationships between effective indicators and factors. The main task of the correlation and regression analysis methods is to analyze statistical data to identify the mathematical relationship between the studied features and to establish, using correlation

coefficients, a comparative estimate of the density of the relationship, which has a specific numerical expression.

The following indicators are taken as evidence to identify the dependence of human capital development on a country's institutionalization in the information economy: human capital indices of 157 countries (The Human, 2018), which are combined into 3 groups according to the level of GNI per capita; indicators of the development of the country's institutional system are also combined into 3 groups according to the level of GNI per capita (Index, 2018). The basis for calculating the indicators of the development of the country's institutional system is the components of economic freedom (Index, 2018). The study was conducted for 157 countries of the world for which the World Bank determined the country's human capital index in 2018 (Index, 2018). The resulting correlation equations should determine the feasibility of material costs for the development of a separate component of the institutional system for the development of human capital. The study of the dependence of the development of human capital on the development of the institutional system will interest not only the scientific layers of countries, but also state and government institutions. The countries were also ranked by gross national income per capita, which is shown in *Table 2* (Jahan et al., 2018).

Table 2a. Ranking countries by GNI per capita (part 1)

Countries			
average GNI			
low GNI per capita (less than 1,005 USD)	lower than the average GNI per capita (from 1,006 to 3,955 USD)	above average GNI per capita (from 3956 to 12235 USD)	high GNI per capita (from 12,236 USD or more)
Benin	Armenia	Albania	Australia
Burundi	Bangladesh	Algeria	Austria
Chad	Bolivia	Argentina	Bahrain
Ethiopia	Ghana	Botswana	Barbados
Gambia	Guatemala	Brazil	Belgium
Guinea	Honduras	Bulgaria	Brunei
Liberia	Egypt	China	Canada
Madagascar	El Salvador	Colombia	Chile
Malawi	Cambodia	Costa Rica	Cyprus
Mozambique	Cote d'Ivoire	Dominican Republic	Denmark

Source: built by the author according to Jahan et al., 2018.

Table 2b. Ranking countries by GNI per capita (part 2)

Countries			
low GNI per capita (less than 1,005 USD)	average GNI		high GNI per capita (from 12,236 USD or more)
	lower than the average GNI per capita (from 1,006 to 3,955 USD)	above average GNI per capita (from 3956 to 12235 USD)	
Nepal	India	Ecuador	Estonia
Rwanda	Indonesia	Gabon	Finland
Senegal	Jordan	Guyana	France
Sierra Leone	Kenya	Iran	Germany
Tanzania	Kyrgyzstan	Jamaica	Greece
Mali	Lesotho	Macedonia	Iceland
Uganda	Mauritania	Malaysia	Ireland
	Moldova	Mauritius	Israel
	Mongolia	Mexico	Italy
	Morocco	Namibia	Japan
	Myanmar	Panama	Korea
	Nicaragua	Paraguay	Kuwait
	Nigeria	Peru	Latvia
	Pakistan	Romania	Lithuania
	Philippines	Russia	Luxembourg
	Sri Lanka	Serbia	Malta
	Swaziland	South Africa	Netherlands
	Tajikistan	Thailand	New Zealand
	Tunisia	Turkey	Norway
	Ukraine	Venezuela	Poland
	Vietnam	Croatia	Spain
	Yemen	Kazakhstan	Sweden
	Zambia		Switzerland
	Cameroon		UAE
	Laos		Great Britain
			USA

Source: built by the author according to Jahan et al., 2018.

From each group, 10 indicative countries are selected to construct the matrix. The group of countries with high gross national income per capita (from 12,236 USD or more) includes Australia, Austria, Belgium, the United Kingdom, the United States, Germany, Japan, and Israel. The group of countries with higher than average gross national income per capita (from 3956 to 12235 USD) includes Bulgaria, China, the Dominican Republic, Romania, Turkey, Kazakhstan, Peru, and Mexico. Ukraine occupies slightly lower positions, entering the group of countries with lower than average gross national income per capita (from 1,006 to 3,955 USD). This group also includes Moldova, Kyrgyzstan, and India (Jahan et al., 2018).

The data for constructing correlation dependencies are given in the following tables. Human capital index indicators for countries with a high level of GNI per capita are shown in *Table 3*.

Table 3. Human capital index for countries with high GNI per capita

Country	HCI	Country rank in HCI rating
Australia	0,79	7
Great Britain	0,78	15
Poland	0,75	30
Norway	0,77	18
Sweden	0,80	8
USA	0,76	24
Finland	0,81	5
Japan	0,84	3
Estonia	0,75	29
Lithuania	0,71	37

Source: The Human, 2018.

A high human capital development index is observed in developed countries such as Japan (3rd place), Finland (5th place in the rating), Australia (7th city in the rating). Comparison with the data on the human development index in accordance with the UNDP report gives the following result *are shown in Fig. 2*.

Not in all cases, the human capital index corresponds to the human development index, which is explained by a different methodology for determining indicators, which was also developed by completely different world institutions – the organization of unification of nations within the framework of UNDP and the World Bank in the document “Human Capital Development Project”. In some cases, the data are significantly different. So, while Norway ranks first in terms of the human development index, in the ranking of the human capital index it is only 18. Former Soviet Union countries, Estonia and Lithuania rank 30 and 35 in the HDI, respectively, and 29 and 37 in the HCI.

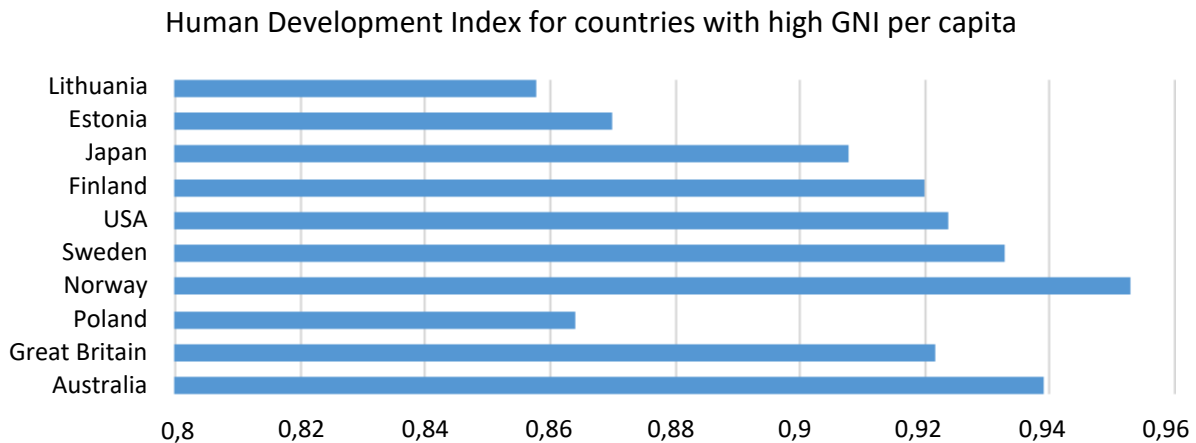


Figure 2. Human Development Index for countries with high GNI per capita, 2017

Source: built by the author according to Jahan et al., 2018.

Table 4a and Table 4b shows the data characterizing the development of the institutional system for constructing a matrix for countries with a high level of GNI per capita (Index, 2018).

Table 4a. Data for calculating the development indicators of the institutional system of countries with a high level of GNI per capita (part 1)

Country	business freedom	labor market freedom	monetary freedom	trade freedom	investment freedom	financial freedom
Variable	X1	X2	X3	X4	X5	X6
Australia	89,1	79,7	87,4	86,2	80	90
Great Britain	91,1	74,4	85,2	86,9	90	80
Poland	67,2	63,9	85	86,9	75	70
Norway	90,4	54,6	73,9	87,9	75	60
Sweden	89,3	53,7	83,8	86,9	85	80
USA	82,7	91,4	78,6	86,7	85	80
Finland	89,9	50,5	86	86,9	85	80
Japan	81,7	79,2	85,4	82,3	70	60
Estonia	75,6	54,8	85,1	86,9	90	80
Lithuania	73,4	64,5	89,9	86,9	80	70

Source: Index, 2018.

Table 4b. Data for calculating the development indicators of the institutional system of countries with a high level of GNI per capita (part 2)

Country	fiscal health	government spending	tax burden	government decency	judicial efficiency	protection of property right
Country	X7	X8	X9	X10	X11	X12
Variable	84,3	61,2	63	77,4	93,4	78,7
Great Britain	53,5	44,4	65,2	79	93,8	92,2
Poland	81,5	47,8	75,9	50,9	56,6	61,8
Norway	97,8	29,2	56,4	93,6	86	86,4
Sweden	96,1	23,2	43,9	92,9	88,2	92,6
USA	54,8	56,5	65,1	71,9	76,9	79,3
Finland	81,1	2,3	66,5	89,8	82,7	89
Japan	49,3	54,1	67,4	79,2	73,2	86
Estonia	99,8	52,6	80,7	75,7	83,9	80,4
Lithuania	96,7	63,9	86,4	50,9	66,7	73,8

Source: Index, 2018.

Table 5 provides indicators of the human capital index for countries with an average level of GNI per capita (The Human, 2018).

Table 5. Human capital index for countries with average GNI per capita

Country	HCI	Country rank in HCI rating
Kyrgyzstan	0,58	76
Turkey	0,63	53
Armenia	0,57	78
Mexico	0,61	64
Tajikistan	0,53	89
China	0,67	46
Ukraine	0,65	50
Romania	0,6	67
Bulgaria	0,68	44
Moldova	0,58	75

Source: The Human, 2018.

This group includes Ukraine, which ranked 50th in this World Bank rating. At the same time, China is observed along with Ukraine - 46th place. Turkey is on the 53rd place. The countries of the former Soviet space – Moldova, Kyrgyzstan, Armenia, Tajikistan – occupy 75, 76, 78, 89 places respectively.

Human development data for countries with average per capita GNI are shown in *Fig. 3*.

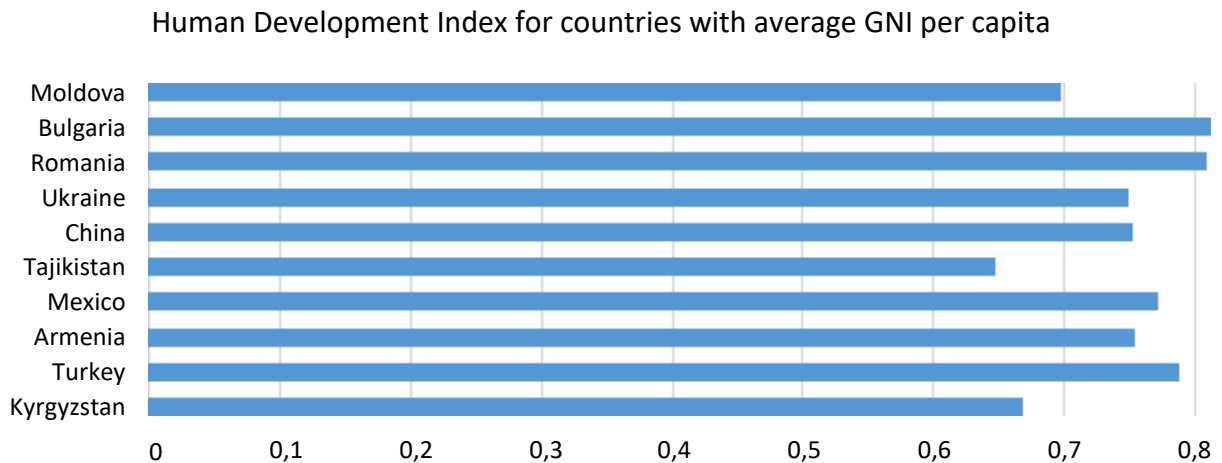


Figure 3. Human development index for countries with average GNI per capita, 2017

Source: built by the author according to Jahan et al., 2018.

A comparison of the human capital index with the data on the human development index in accordance with the UNDP report gives the following result. In some cases, the data are significantly different. According to UNDP, Ukraine takes 88th place in terms of human development, which is taken into account as an average indicator of the level of human development. In the group of countries with an average level of GNI per capita among the above former countries of the Soviet Union, Armenia occupies the highest city 83 (5 positions higher than Ukraine).

Table 6 shows the data characterizing the development of the institutional system for constructing a matrix for countries with an average GNI per capita (Index, 2018).

Table 6. Data for calculating the development indicators of the institutional system of countries with an average level of GNI per capita

Country	business freedom	labor market freedom	monetary freedom	trade freedom	investment freedom	financial freedom
Variable	X1	X2	X3	X4	X5	X6
Kyrgyzstan	73,3	77,9	74,9	74,5	60	50
Turkey	63,3	47,6	72,3	78,6	75	60
Armenia	78,7	69,9	75,8	80	75	70
Mexico	67,5	59,8	79,2	88	75	60
Tajikistan	63,4	52,2	69,6	70,6	25	30
China	54,9	61,4	71,4	73,2	25	20
Ukraine	62,7	52,8	60,1	81,1	35	30
Romania	65,2	66,8	82,8	86,9	75	50
Bulgaria	64,3	66,1	82,8	86,9	70	60
Moldova	66	39,9	73,2	78,3	55	50

Country	fiscal health	government spending	tax burden	government decency	judicial efficiency	protection of property right
Variable	X7	X8	X9	X10	X11	X12
Kyrgyzstan	89,2	58,2	93,8	29,4	22,1	50,2
Turkey	93,6	68,1	74,7	42	54,5	54,7
Armenia	67,2	80	84,7	40,5	47,4	55,3
Mexico	69,8	78,1	75,7	26,9	39	58,6
Tajikistan	90,4	71,4	91,8	38,2	50,3	46,8
China	85,9	71,6	70,4	47,3	65,4	46,7
Ukraine	75,9	45	80,2	29	29,5	41
Romania	91,1	66,9	87,3	40	59,7	61
Bulgaria	94,3	60,5	90,9	38,2	42,5	63,6
Moldova	90	56,7	85,3	26,6	26,3	53,5

Source: Index, 2018.

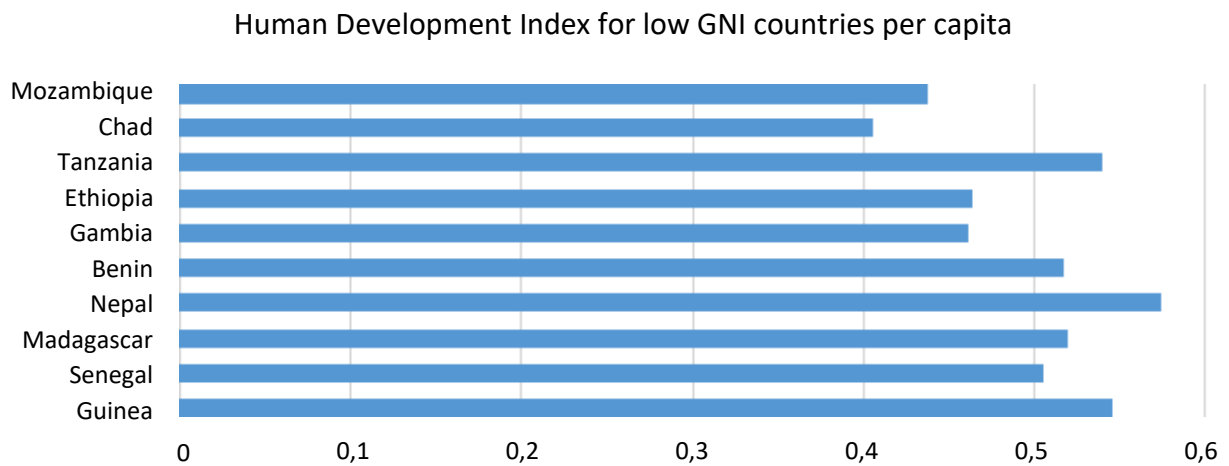
Table 7 provides indicators of the human capital index for countries with a low level of GNI per capita (The Human, 2018).

Table 7. Human capital index for low per capita GNI countries

Country	HCI	Country rank in HCI rating
Guinea	0,37	141
Senegal	0,42	121
Madagascar	0,37	140
Nepal	0,49	102
Benin	0,41	127
Gambia	0,4	130
Ethiopia	0,38	135
Tanzania	0,4	128
Chad	0,29	157
Mozambique	0,36	148

Source: The Human, 2018.

This group includes the poorest countries of the modern world – Mozambique, Guinea, Madagascar, Chad, Ethiopia. In the ranking of the human development index, they rank from 152 to 189. Human development data for these countries are shown in *Fig. 4*.

**Figure 4.** Human Development Index for low GNI countries per capita, 2017

Source: built by the author according to Jahan et al., 2018.

Data characterizing the development of the institutional system for constructing a matrix for countries with a low level of GNI per capita is shown in *Table 8* (Index, 2018).

Table 8. Data for calculating the development indicators of the institutional system of countries with a low level of GNI per capita

Country	business freedom	labor market freedom	monetary freedom	trade freedom	investment freedom	financial freedom
Variable	X1	X2	X3	X4	X5	X6
Guinea	54,1	54	71,8	61,2	50	40
Senegal	51,5	41,4	84,7	66,7	60	40
Madagascar	45,6	41,5	73,4	78	55	50
Nepal	64,6	43,5	65,8	66,6	10	30
Benin	60,7	49,9	84,7	55,6	80	50
Gambia	54,2	64	63,2	64,7	75	50
Ethiopia	40,2	51,3	67,1	60,7	35	20
Tanzania	50	63,9	70,3	76,9	55	50
Chad	29,4	40,3	79,9	52,2	60	40
Mozambique	58	37,8	66,7	76,7	35	50

Country	fiscal health	government spending	tax burden	government decency	judicial efficiency	protection of property right
Variable	X7	X8	X9	X10	X11	X12
Guinea	61	80,6	65,9	26,9	28,2	32,4
Senegal	58,4	72,7	68,5	42,6	40,4	41,3
Madagascar	82,5	92,9	90,3	17,8	21,4	33,2
Nepal	98,5	87,6	84,2	24,6	36,2	37,5
Benin	49,7	85,6	67,4	30,2	31,3	35,5
Gambia	0	74	71,9	36,8	38,8	34,4
Ethiopia	85,5	90,6	76,5	37,7	37,6	31,1
Tanzania	79	89,8	79,8	31,8	34,7	38
Chad	81,9	90,5	44,8	23,1	24,1	25,1
Mozambique	0	60,7	70,6	28,2	36,3	35,4

Source: Index, 2018.

To study the qualitative and quantitative assessment of the relationships between the level of development of the country's human capital and institutional factors of influence, multivariate correlation and regression analysis is used. To calculate, it is suggested to use the formula:

$$Y = f(\beta, X) + \varepsilon, \quad (2)$$

where Y – dependent variable;

$X = X(X_1, X_2, \dots, X_m)$ – independent variables (political and legal factors, economic factors, social factors, organizational and administrative and information and communication factors, scientific and technological factors, institutional factors);

$\beta = \beta(\beta_0, \beta_1, \beta_2, \dots, \beta_m)$ – regression coefficient;

ε – random error.

In order to determine the dependence of human capital development on the level of development of the country's institutional system in the information economy, let's construct twelve-factor correlation and regression models for 157 countries, which are combined into three groups according to the level of gross national income per capita. To calculate, it is suggested to use the formula:

1) for countries with a high level of gross national income per capita:

$$Y_1 = 0,36 + 0,05 X_1 + 0,05 X_2 + 0,04 X_3 + 0,06 X_4 + 0,02 X_5 + 0,05 X_6 + 0,06 X_7 + 0,08 X_8 + 0,10 X_9 + 0,04 X_{10} + 0,04 X_{11} + 0,05 X_{12} \quad (3)$$

2) for countries with an average level of gross national income per capita:

$$Y_2 = 0,28 + 0,04 X_1 + 0,12 X_2 + 0,04 X_3 + 0,03 X_4 + 0,02 X_5 + 0,03 X_6 + 0,04 X_7 + 0,07 X_8 + 0,08 X_9 + 0,05 X_{10} + 0,06 X_{11} + 0,10 X_{12} \quad (4)$$

3) for countries with a low level of gross national income per capita:

$$Y_3 = 0,19 + 0,02 X_1 + 0,03 X_2 + 0,01 X_3 + 0,05 X_4 + 0,01 X_5 + 0,02 X_6 + 0,01 X_7 + 0,05 X_8 + 0,04 X_9 + 0,07 X_{10} + 0,08 X_{11} + 0,06 X_{12} \quad (5)$$

Calculation of the correlation matrix provided an opportunity to conclude that there is a significant relationship between the effective indicator and factor values. The multiple determination coefficient r^2 is 0.53, therefore, the effective indicator depends on 12 factors by 53%. The multiple correlation coefficient of 0.728 indicates a close relationship between the indicators and is significant and random (according to the F-criterion).

5. Conclusions

It is revealed the relationship between the human capital index and the development of the country's institutional system. The selection of indicators describing the dependence of the development of human capital on the development of the country's institutional system in the information economy, which included political, legal, economic, social, institutional, using an expert analysis method, is carried out.

For a multifactorial phenomenon, as the dependence of the development of human capital on the level of development of the country's institutional system in the information economy, the methods of multiple correlation and regression analysis are used. The study is conducted for 157 countries of the world for which the World Bank determined the country's human capital index in 2018. As a result, correlation equations are constructed that describe the dependence of the development of human capital on the level of development of the country's institutional system in the information economy. They should determine the feasibility of material costs for the development of a separate factor of the influence of the institutional system for the development of human capital.

The constructed models show that the greatest correlation between the human capital index and the selected indicators of the country's institutional system development exists: for countries with a high human capital index and high gross national income per capita – government labor costs, tax burden; for countries with an average human capital index and with an average gross national income per capita, to which Ukraine belongs, freedom of the labor market, protection of property rights; for countries with a low human capital index and low gross national income per capita – the effectiveness of the judicial system, government decency.

According to the calculated regression coefficients, it is established to what extent human capital is sensitive to the variability of the institutional system, it makes it possible to assess how much and what factors delay and accelerate the development of human capital, and the ability to develop forecasts of changes in the level of human capital.

References

- Ali, M., Egbetokun, A., & Memon, M. (2018). Human capital, social capabilities and economic growth. *Economies*, 6(2), 1-18. <https://doi.org/10.3390/economies6010002>
- Becker, G. S. (1964). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. Chicago: University of Chicago Press. <https://doi.org/10.1177/000271626536000153>
- Bryukhovetska, N. Yu., & Chorna, O. A. (2015). *Upravlinnia rozvytkom liudskoho kapitalu pidpriemstv: instytutsionalnyi aspekt [Management of human capital the development of enterprises: institutional aspect]*. Kyiv: Institute of Industrial Economics of the National Academy of Sciences of Ukraine. Retrieved from <https://iie.org.ua/monografiyi/bryuhovetska-n-yu-chorna-o-a-upravlinnya-rozvitkom-lyudskogo-kapitalu-pidpriemstv-institutsionalniy-aspekt-2015-r/>
- Dalevska, N., Khobta, V., Kwilinski, A., & Kravchenko, S. (2019). A model for estimating social and economic indicators of sustainable development. *Entrepreneurship and Sustainability Issues*, 6(4), 1839-1860. [https://doi.org/10.9770/jesi.2019.6.4\(21\)](https://doi.org/10.9770/jesi.2019.6.4(21))
- Flamholtz, E. G, Bullen, M. L., & Hua, W. (2002). Human resource accounting: a historical perspective and future implications. *Management Decision*, 40(10), 947-954. Retrieved from https://www.academia.edu/3355572/Human_resource_accounting_a_historical_perspective_and_future_implications

- Jahan, S., & et al. (2018). *Human Development Indices and Indicators: 2018 Statistical Update*. New York, NY: The United Nations Development Programme. Retrieved from http://hdr.undp.org/sites/default/files/2018_human_development_statistical_update.pdf
- Kolomiets, V., & Golovkova, L. (2017). The institutional content of the human capital of the national economy. *Baltic Journal of Economic Studies*, 3(5), 289-293. <https://dx.doi.org/10.30525/2256-0742/2017-3-5-289-293>
- Kwilinski, A., Pajak, K., Halachenko, O., Vasylichak, S., Pushak, Ya., & Kuzior, P. (2019). Marketing Tools for Improving Enterprise Performance in the Context of Social and Economic Security of the State: Innovative Approaches to Assessment. *Marketing and Management of Innovations*, 4, 172-181. <http://doi.org/10.21272/mmi.2019.4-14>
- Liashenko, N. Ye. (2016). Elektronne portfolio yak zasib formalizatsii liudskoho kapitalu firmy [Electronic portfolio as a tool of formalization the company's human capital]. *Upravlinnia proektamy ta rozvytok vyrobnytstva – Project Management and Production Development*, 4(60), 18-29. Retrieved from http://www.pmdp.org.ua/images/Journal/60/2_Lyashenko%20N.pdf [in Ukrainian].
- Liashenko, P. A. (2017). Diapazon rozuminnia ekonomichnoho rozvytku rehionu [Range of understanding of the region's economic development]. *Upravlinnia proektamy ta rozvytok vyrobnytstva – Project Management and Production Development*, 2(62), 122-126. Retrieved from <http://www.pmdp.org.ua/images/Journal/62/9.pdf> [in Ukrainian].
- Lyashenko, V., & Pidorycheva, I. (2019). The formation of interstate and cross-border scientific-educational and innovative spaces between Ukraine and the European Union member states in the digital economy. *Virtual Economics*, 2(2), 48-58. [https://doi.org/10.34021/ve.2019.02.02\(3\)](https://doi.org/10.34021/ve.2019.02.02(3))
- Mahmood, H., & Alkahtani, N. (2018). Human resource, financial market development and economic growth in Saudi Arabia: a role of human capital. *Economic Annals-XXI*, 169(1-2), 31-34. <https://doi.org/10.21003/ea.V169-06>
- Miller, T., Kim, A. B., & Roberts, J. M. (2018). *Index of Economic Freedom*. Washington, D.C.: The Heritage Foundation. Retrieved from https://www.heritage.org/index/pdf/2018/book/index_2018.pdf
- Pajak, K., Kamińska, B., & Kvilinskyi, O. (2016). Modern trends of financial sector development under the virtual regionalization conditions. *Financial and Credit Activity: Problems of Theory and Practice*, 2(21), 204-217. <https://doi.org/10.18371/fcaptp.v2i21.91052>
- Proekt razvitiya chelovecheskogo kapitala [Human Capital Development Project]* (2018). Washington, D.C.: World Bank. Retrieved from <https://openknowledge.worldbank.org/bitstream/handle/10986/30498/33324RU.pdf?sequence=13&isAllowed=y> [in Russian].
- Radieva, M. (2018). Institutional modernization of the Global economy. *Baltic Journal of Economic Studies*, 4(5), 283-290. <https://doi.org/10.30525/2256-0742/2018-4-5-283-290>
- Radieva, M., Tkach, A., Kolomiets, V., Rekun, I., Tkach, T., & Zolkina, O. (2018). *Transformatsiini protsesy v ekonomitsi: instytutsionalnyi kontekst [Transformation Processes in Economics: An Institutional Context]*. Melitopol: Color Print. <https://doi.org/10.32901/978-966-2489-64-4/2018> [in Ukrainian].
- Roslender, R. (2009). The prospects for satisfactorily measuring and reporting intangibles: Time to embrace a new model of (ac)counting? *Journal of Human Resource Costing & Accounting*, 13(4), 338-359. <https://doi.org/10.1108/14013381011010169>

- Shashyna, M. V. (2018). Tendentsii zmin instytutsiionalnoho seredovyshcha Ukrainy [Trends in changes in the institutional environment of Ukraine]. *Ekonomika, finansy, pravo – Economics, finance, law*, 12(5), 26-31. Retrieved from http://konferencia.com.ua/images/_archievement/2018/efp%2012-5%202018.pdf [in Ukrainian].
- Siddiqui, A., & Rehman, A. ur (2016). The Human Capital and Economic Growth Nexus: in East and South Asia. *Applied Economics*, 49(28), 2697-2710. <https://doi.org/10.1080/00036846.2016.1245841>