International analysis of the higher education system effectiveness as a factor in the development of human capital

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In the modern world, the role of universities is changing significantly. This is due to the fact that universities transform their social function and development strategies in accordance with the modern society existing mode in the changing epoch and these transformations are associated with these processes in the social, economic, technological and cultural sphere.

Social, economic, and political problems of inequality, poverty, migration, racism, etc. are critical for the modern world. There are other risks and challenges faced by society today – technological and environmental.

Under these conditions, universities are expected not only to provide education conducive to the development of human capital, but also to become centers where all policies and strategies for their development are aimed at the common good.

The influence of university graduates on the global socio-economic sphere is wide and varied, its main aspects are covered and united by the theory of human capital and the concept of the educational space of the countries of the world [2, 3]. People with higher education are not only more qualified and politically mature, which is obviously a consequence of education, but even, for example, live much longer. Studies in the USA [9] and Russia [7] show that the average life expectancy of people with higher education is more than 6 years longer. Thus, one can find a wide variety of evidence of the universities' influence on the life of both individual countries and society as a whole.

Almost half of the universities in the world [11] are public. Existing statistics show that in any country in the world where there are higher education organizations, at least one university is state-owned, and there are 39 countries in the world where all universities

are state-owned. This confirms the idea that in all countries the state bears the cost of higher education, expecting a complex socio-economic effect from its high level among its citizens, which means the need to evaluate it.

Given the trend of recent decades towards a certain degree of standardization of higher education institutions (for example, through indicators, standards that give priority to research and the impact of scientific publications on teaching and learning), it should, however, be understood that there is no ideal, single model of the university. In many ways, this refers to the use of university rankings, which are widely used to assess the quality of education. The missions of universities are different depending on the various social, political, economic, and cultural conditions that develop in the regions where these universities operate. Therefore, the standardization of universities, obviously, will not always work for the benefit of the university and the social, political, economic, cultural and educational space surrounding it.

However, the scale of the effect of higher education explains why university rankings should not be used for national assessments. Success in university rankings give some idea of the quality of the whole system, its successes, but the main thing is that universities evaluate science, publications, attraction of funding, that is, what happens inside.

An earlier analysis [1] showed that at the moment there is no ranking that can demonstrate an absolutely successful university. Nevertheless, as mentioned earlier, in order to identify trends, assess the dynamics, and conduct an initial international analysis of the surrounding university and the educational space (of a region, country, world) created by it, there is a need to develop tools that can take into account multiple factors directly or indirectly affecting and at the same time having the ability to be subjected to a clear and simple interpretation, on the development of the educational space.

Index concept

Creating such a index requires the consideration of many factors. The basis of the calculation methodology is the concept of "Foundations for the Development of Human Capital", set out in 2001 [8], which considers 8 components that allow evaluating education as a source of human capital formation in the countries of the world:

1. Personal conditions (investments) (Resources / Inputs)
2. Education and Training
3. Outcomes
4. Social conditions (investments) (Resources / Inputs)
5. Production Processes
6. Citizenship Processes
7. Social relations (Earnings / Output)
8. Social efficiency (Efficiency / Output)

The index, based on a comprehensive methodology for calculating the human capital index, can become a tool for analyzing the higher education system, considering the educational space of the country.

Index indicators

The second stage of creating an index is the selection of indicators that evaluate each of the components. A lot of statistical information is collected every year, but the main technical difficulty in choosing indicators can be different units of measurement (place, percentage, absolute values). For the current purposes of the pilot index, this task can be simplified by choosing a comprehensive index, some of the indicators of which demonstrate different aspects of human capital formation. A popular integrative rating, the Prosperity Index [4] of the British Legatum Institute, was chosen as such a source, which represents the degree of public well-being as a set of 295 criteria divided into nine categories: economics, entrepreneurship, management, education, healthcare, security, freedom, social capital, ecology [10].

By combining index indicators in a single methodology, we get a result as the one shown below.

1. Personal conditions (investments) (Resources / Inputs)

In the theory of human capital, personal conditions, also referred to as investments, are considered as indicators such as the conditions for the birth (1.1), growth (1.2) and development (1.3) of children under the age of 5 years. Due to the fact that only the higher education system is analyzed, these criteria are supplemented by criteria related to education, which, in turn, can be divided into the following subgroups: living conditions and health of students (1.4), primary school (1.5), secondary school (1.6), indicators of the quality of education and its accessibility (1.7).

Another aspect that can and should represent such a rating is the dynamics of the indicator (Fig. 1).

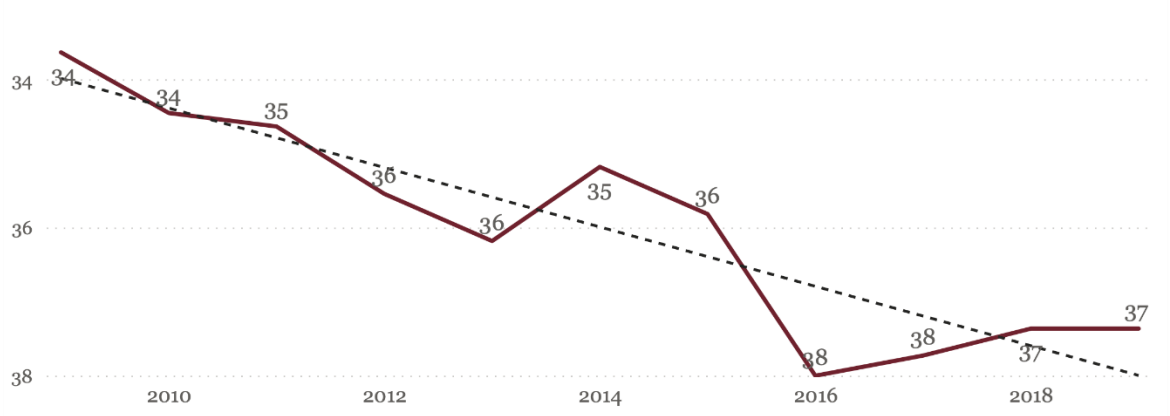

Fig. 1. Cumulative dynamics of the first group of indicators by the example of Switzerland.

It seems appropriate to present the values of the index indicators in numerical (Fig. 2) and graphical form (Fig. 3).

Births attended by skilled health staff	1
Lower-secondary completion	1
5-14 mortality	4
Secondary education quality	8
Access to quality education	11
Under 5 mortality	26
Pre-primary enrolment	51
Secondary school enrolment	60
Primary completion	82
Primary enrolment	83
Primary education quality	84

Fig.2. The place of the country in the world according to the achievement of certain indicators

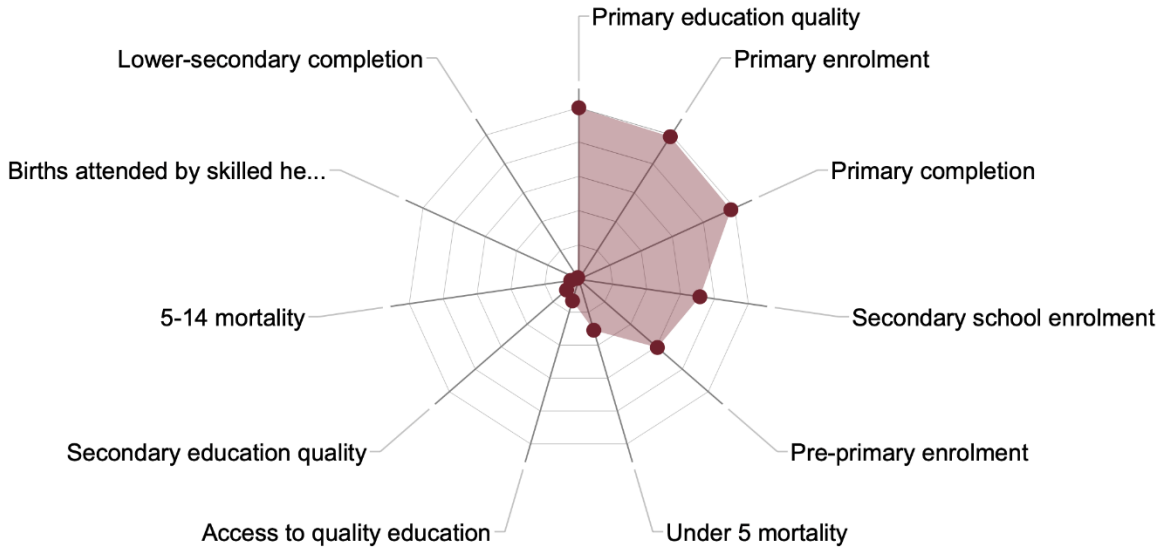

Fig.3 Petal diagram of the country's place in the world in terms of achieving certain indicators by the example of Switzerland.

2. Education and Training

When assessing the contribution of higher education to human capital, this section includes only indicators assessing university education, for example:

• quality of vocational training;

• skills of university graduates;

• admission to a higher educational institution;

• average success in the ratings of higher education institutions across the country;

• share of completion of higher education.

3. Outcomes

Direct outcomes include adult skills, namely:

• adult literacy;

• level of education of the adult population;

• digital literacy of the population.

4. Social conditions (investments) (Resources / Inputs)

Social conditions in this context are the socio-economic environment that surrounds an adult. The criteria of this section can be divided into such subgroups as demographic indicators, the level of provision with the necessary amenities and electricity, the availability of access to cellular communications, the Internet:

- access to tap water;
- access to basic sanitation;
- access to basic water services;
- access to electricity;
- unsafe water, sanitation or hygiene;
- Internet using;
- fixed broadband subscriptions;
- network coverage 2G, 3G and 4G;
- bandwidth of the international Internet.

5. Production Processes

The indicators describing relations of production describe unemployment and employment by age, employment by industry, labor productivity:

- labor force participation rate (% of people aged 15 and over);
- labor productivity.

6. Prosperity (Citizenship processes)

Prosperity in terms of human capital concerns, first of all, various aspects and levels of poverty, vulnerability, certain aspects of labor activity:

- protection of intellectual property;
- hired and paid workers (%).

7. Social relations (Earnings / Output)

Social relations, like social efficiency, are among the most difficult to measure aspects. This explains both a number of formulations of criteria taken directly from complex indices, and the scatter of aspects of social relations and social efficiency.

Social relations can be divided into the following subgroups: the level of mutual assistance, assistance to those in need through social institutions, the assessed level of interpersonal communication, destructive behavior, tolerance.

8. Social efficiency (Efficiency / Output)

Social efficiency is indicators of social relations brought to the state level: the level of crime, the level of development of social institutions, the level of trust in state institutions, the level of suicides, the number of refugees and migrants, the level of population growth:

- civil justice;
- consensus on democracy and market economy as a goal;
- political participation and rights;
- the quality and credibility of the government;
- quality of judicial administration.

The combined radar chart (Fig. 4) allows judging the most unfavorable (left) and positive (right) aspects.

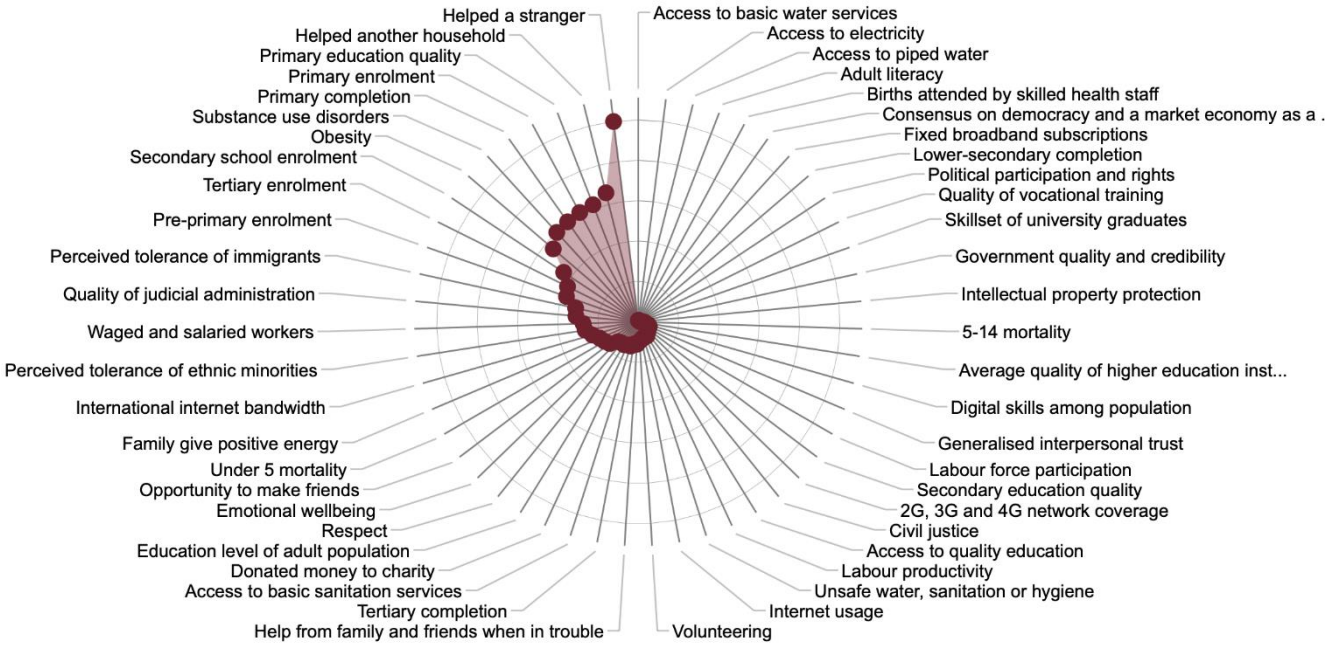

Fig. 4. Combined radar chart of criteria by the example of Switzerland.

An enlarged radar chart (Fig. 5) allows getting the most comprehensive level of information study using the proposed method.

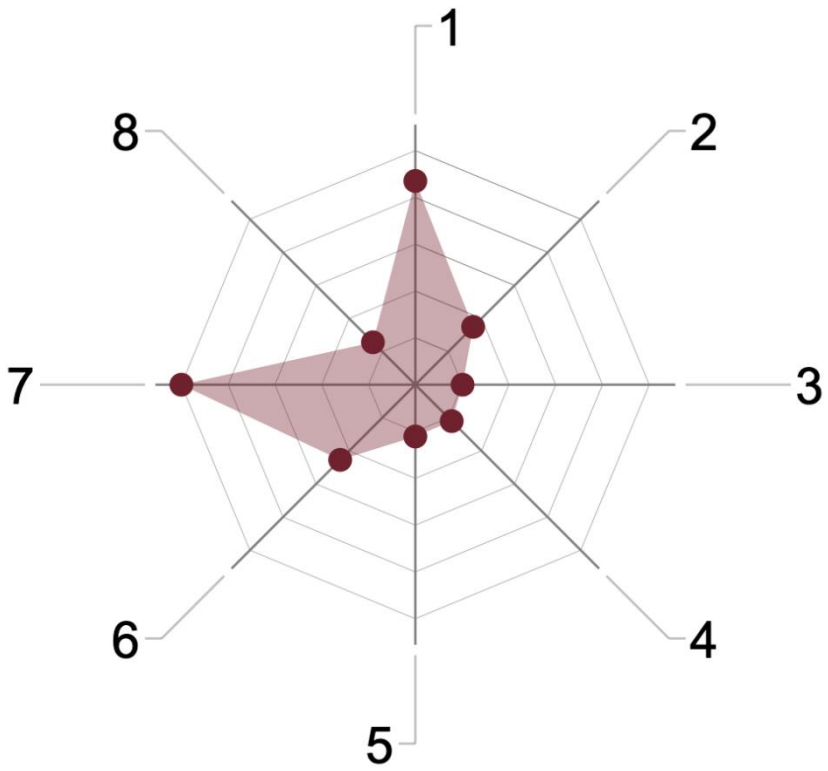

Fig. 5. Enlarged radar chart by the example of Switzerland.

Index calculation method

The information presented and grouped for ranking after the stages of choosing a concept and indicators needs a calculation method. It was chosen for the pilot index, in order to avoid the complexity of the calculation, which, within the framework of the paper, would remain outside the text, making the calculations opaque, indicators were selected which are already ranked in the prosperity index and are presented in places among 165 countries.

In fact, the effectiveness of higher education is proposed to be calculated as the arithmetic mean of three groups of indicators:

Box 1. Qualities of higher education (Group 2)

Box 2. The qualities of the educational space (Groups 1, 3-8) as a set of conditions for higher education, on the one hand, and its implementation, on the other.

Box 3. Increments of human capital (difference of Groups 1 and 3), applying the cybernetic concept of the "black box", according to which what happens inside the system is estimated by the strength of the signal transformation when passing from the entrance to the system to its exit. On the other hand, this approach, like no other, makes it possible to assess the complex impact of education on demography and the economy without going into detail.

The outcomes of calculations for 50 leading countries are shown in Table 1.

Table 1. The final ranking of the countries of the world in terms of the effectiveness of the contribution of higher education to the growth of human capital

Total	Country	Level of tertiary education (Box 1)	Level of educational space (Box 2)	Increment of human capital (Box 3)
1	Switzerland	15	4	10,5
2	United States of America	12	15	2,5
3	Iceland	16	5	18,5
4	Germany	24	9	13,5

5	Ireland	14	18	20,5
6	Netherlands	15	7	33,5
7	Canada	19	10	28,5
8	Australia	9	13	37
9	New Zealand	12	12	41
10	Israel	28	23	22,5
11	Denmark	9	1	65,5
12	Sweden	26	3	47
13	Taiwan	39	33	12
14	Belgium	16	22	47
15	Great Britain	24	8	56
16	Estonia	31	19	44
17	Czech	36	29	33,5
17	France	26	20,5	52
19	Finland	12	6	84
20	Norway	21	2	93
21	Slovakia	78	37	5
22	Malaysia	31	40	49,5
23	South Korea	26	26	69
24	Luxembourg	51	14	59,5
25	Singapore	9	11	118
26	Russia	48	46,5	47
27	Cyprus	49	31	62
28	Kazakhstan	72	42	28,5
29	Costa Rica	42	49	52
30	Ukraine	48	65	31,5
31	Philippines	60	81	6,5
31	Latvia	54	34	59,5
33	Azerbaijan	68	74	6,5
34	Slovenia	44	24	84
35	Armenia	78	64	10,5
35	Jordan	73	75,5	4
37	Japan	30	20,5	102,5
38	Romania	84	54,5	15,5
39	Austria	16	17	126,5
40	Chile	22	41	98
41	Indonesia	64	75,5	25
42	Qatar	59	35	74
43	Saudi Arabia	45	46,5	80
44	Turkmenistan	89	78	8

45	Hong Kong	24	16	138,5
46	Lithuania	57	32	93
47	Equatorial Guinea	67	113	2,5
48	Lebanon	68	98	17
49	Tajikistan	83	101	1
50	Gabon	74	102	13,5
51	Greece	53	48	88,5

Conclusion

The development of the country's human capital is one of the priority strategic tasks that require control over the correctness of decision-making. University rankings cannot solve this problem for the level of higher education, but the creation of a comprehensive index methodological approach to assessing the development of human capital based on existing statistical data and a proven methodology seems to be a feasible task.

Pilot index was carried out according to the methodology developed by the author, considering three aspects:

- quality of higher education;
- the contribution of higher education as measured by the "black box" principle;
- educational space of the country.

The calculations made it possible form a single ranking, identify leaders who are noted by a high level of labor productivity, scientific research, and the standard of living of citizens.

The conducted pilot study contains a number of simplifications and is only the first stage of the study, however, it has already shown, in general, the effectiveness of this methodology for researching and assessing countries in terms of the contribution of higher education to the effective growth of human capital.

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