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Assessment of Effectiveness of Use of Intellectual Potential of a University: a Methodological Approach

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ABSTRACT

This article presents the results of theoretical analysis of existing approaches to the categories of the "intellectual capital" and "intellectual potential" of an organization. The authors identified the specific peculiarities of developing the intellectual potential of a university and propose their own view of its structure. A comparative analysis of the methodological approaches to the quantification of the intellectual potential of a university was conducted. The study proposes guidelines on monitoring organization, a system of indicators and methods of assessing the effectiveness of the use of the intellectual potential of a university. Moreover, the results of a quantitative assessment of the effectiveness of the use of intellectual potential on the example of the leading Russian universities listed in the QS World University Ranking are presented. The suggested assessment methodology is versatile and can be applied not only to the Russian universities but also on a global scale.

KEYWORDS

educational process, effectiveness of universities' activities, intellectual capital, intellectual potential development, formation of competitiveness of higher education institutions

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Introduction

Evolution of the national system of higher professional training is an essential element in developing the country's intellectual potential (Clark, 1986; Kalimullin & Masalimova, 2016). At the same time the effectiveness of universities' activities is highly dependent on the level of development of their own intellectual potential and the extent of its application (Shehzad et al., 2014; Etzkowitz, 2000).

The increased interest of researchers in this problem is due to the fact that it is the intellectual component of a university that is the foundation of its global competitiveness (Bragin, Selyanskaya & Stukalova, 2014; Yumasheva, 2010; Bronnikova & Zuntova, 2015). In this regard, we think it is important to develop

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a toolkit for evaluating the effectiveness of the use of the intellectual potential of a university.

Literature Review

In the present conditions of the knowledge economy, the intellectual potential of a university is an objective prerequisite for its competitiveness, including such competitiveness within the framework of the global educational space (Garnett, 2001; Drezinsky, 2014; Ramírez & Vanderdonck, 2013).

It is also pertinent to point out that the scientific research of the 20th and 21st centuries, the categories "intellectual capital" and "intellectual potential" are viewed as sources of capitalization of knowledge and production (Edvinsson & Malone, 1997; Secundo et al., 2015). Meanwhile, the terms "intellectual potential" and "intellectual capital" are not clearly defined in the scientific literature and in practice. Researches often confuse one for the other.

In order to provide certainty, let's turn to the origins of the theory of intellectual capital. Thus, the definition of the term "intellectual capital" was first offered by T. Stewart (1997). He defined intellectual capital as the sum total of all that a company's employees know and that gives the company a competitive advantage on the market: "... patents, processes, management skills, technologies, expertise, and information on customers and suppliers. Combined together, these skills make up the intellectual capital".

However, in our opinion, the above definition means on one hand an intellectual potential and, on the other hand, deals with its implementation (capitalization) through patents, management skills, technology, etc. Knowledge and information have to be somehow implemented in order to truly become a capital.

As opposed to intellectual resources, intellectual potential is a set of possibilities, often not yet realized, not yet formally registered, but used in actual fact to carry out an activity (Levitin, 2011; Garafiyeva, 2014). In general terms, potential can be defined as a set of means and capabilities needed to achieve a certain result, as a continuum of probabilistic possibilities of this or that condition (in the behavior of the subject) in specific circumstances (Montessori, 2015). Intellectual potential of an organization is an integral concept that consists of much intellectual potential of entities engaged in professional activities (Plis, 2014).

As part of the traditional ideas of capital, its increment occurs in the process of circulation and turnover (Coleman, 1988). According to Marxist ideas, capital is movement, a process passing through various stages. As a result, capital is self-expanding value (Bardhan, 1985). In the modern sense, intellectual capital is a clear, unambiguous, transmitted knowledge possessed by an organization; knowledge that can be converted into value (Brooking, 1996).

In this way, economists define intellectual capital as a form of capitalization of intellectual potential (Fazlagic, 2005; Fortune, 1998). Intellectual capital is formed from parts of the intellectual resources of an organization developed by people. In the production of a product or service as a result of intellectual labor, accumulation of intellectual capital is taking place and the intellectual capital of a business entity is created (Edvinsson & Sullivan, 1996). Therefore, the effective use of the intellectual potential of an organization is the basis for the process of building its intellectual capital.

However, the structure of a university's intellectual potential will undoubtedly have some specific features. Firstly, the very sphere of higher education is a highly intellectual sector of the economy (Bronnikova & Zuntova, 2015). Secondly, the specificity of the intellectual potential of a university lies in the fact that it is where the intellectual resources of the subjects and objects of scientific and educational activities as well as the resources of the university's strategic partners interact (Yumasheva, 2010). Thirdly, the specifity of the structure of a university's intellectual potential is associated with the specifics of the product produced by the university (Pulic, 1998). These characteristics led to the existence of different approaches to university's intellectual potential exploring.

Aim of the Study

The purpose of the research is to develop methodological support enabling a quantitative assessment of the effectiveness of the use of the intellectual potential of a university, and testing such methodology on the example of the leading Russian universities incorporated in the international QS rating.

Research questions

The research questions were as follows:

What are the structural components of a university's intellectual potential? What are the main principles of organizing the university's intellectual potential monitoring?

Method

Methodological framework of our study is presented in Table 1.

Table 1. Research methodological framework

Theoretical review	Comparative analysis of the methodological approaches to the quantification of the intellectual potential of a university An expert review method
Methodological developments	System of indicators and methods of assessing the effectiveness of the use of intellectual potential by a university
Empirical studies	Testing the suggested methodology for assessing the effectiveness of the use of intellectual potential on the example of Russia's leading universities

Data, Analysis, and Results

The Structure of a University's Intellectual Potential

To effectively manage and quantify the intellectual potential of an organization, it is important to study its structure. Structure here is taken to mean a set of internal connections, the internal organization of an entity and its structure. There are a variety of options towards understanding and developing the structure of an organization's intellectual potential proposed by Russian and foreign researchers investigating this problem. The theoretical study that we conducted (Brooking, 1996; Fazlagic, 2005; Shehzad et al., 2014) allowed us to summarize the different approaches and to find out that the structure of the intellectual potential of any organization, regardless its industry sector, must include the following elements or components:

- human resources (knowledge, skills, professional competence, experience and motivation);
- intellectual property as intangible assets (patents, licenses, trademarks, copyright, know-how, etc.)
- marketing (market) assets (brand image and reputation of the organization, customer base, order portfolio on the national and international markets);
- infrastructure assets (management philosophy, corporate culture, management processes, organizational and legal model of management, information technologies).

As we see, scholars often miss such an important component of the educational process as is the intellectual potential of students as well as market potential which is an important factor of a university's competitiveness.

In view of the above, it seems appropriate to highlight the three main components which are part of the intellectual potential of a university:

- intellectual potential of research employees and educators (faculty);
- intellectual potential of students of all educational levels (bachelors and professionals, masters, graduate and doctoral students);
- intellectual potential of the university itself, including its intellectual property in the form of intangible assets, marketing and infrastructure assets.

The relationship of university intellectual potential components is presented in Figure 1.

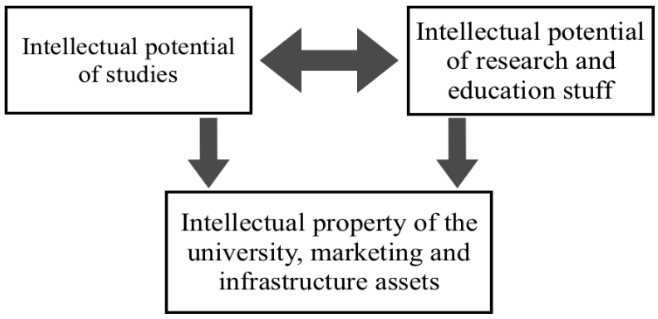

Figure 1. Relationship of university intellectual potential components
Source: Own results.

As a result of the interaction of the students and researchers and educators of a university, the university's intellectual property is formed as well as its marketing and infrastructure assets.

Comparative Analysis of the Methodological Approaches to Assessing the Effectiveness of a University's Intellectual Potential

In recent years, the scientific literature has seen a number of publications devoted to methodologies of assessing the intellectual capital (Fazlagic, 2005; Ramírez & Vanderdonck, 2013) and intellectual potential of universities (Bronnikova & Zuntova, 2015; Garafeeva, 2011).

In our opinion, the methodological approach proposed by G. Garafeeva (2011) is interesting. The scholar proposes a system of indicators to measure intellectual potential which consists of two subsystems: indicators characterizing the intellectual potential of a university's faculty; and indicators

characterizing the intellectual potential of the university as a whole. This system of indicators is consistent with our understanding with respect to the structure of intellectual potential (Table 2).

Table 2. University Intellectual Potential Assessment Indicators

Category	Indicator
Intellectual potential of the university faculty	
Qualification	Number of doctors of science, persons
Prospects	Total number of faculty members aged 30 to 49 years, persons
Level of training	Total number of post-graduate students and academic staff trained in the world's leading research and university centers, persons
Intellectual research potential of a university	
Effectiveness of research and innovation	Number of articles in scientific journals indexed by foreign and Russian organizations (Web of Science, Scopus, Russian citation index), units. Income from research and development from all sources, mln. Rubles Number of graduate and doctoral students defending their degree theses on time, persons Number of intellectual property items registered in accounting, units. Number of small innovation businesses, units.
Effectiveness of development work	Share of development work in the total R&D, %
Facilities	Number of scientific laboratories equipped with high-tech equipment, units.
International recognition	Income from research and development in the framework of international scientific programs, mln. Rubles

A distinctive feature of the above methodology is as follows: the first subset of indicators characterizes the quality of the intellectual potential of university faculty; in the second subset, three of the four indicators describe the effectiveness of the use of the university's potential. For the comparative assessment of the intellectual potential of universities, the author proposes to develop an integral index as the sum of the arithmetic means included in each of the category subsets.

A clean advantage of the proposed approach is the author's attempt, firstly, to use modern scientometrics indicators to judge the academic reputation of a university as part of the global educational space; secondly, to address effectiveness, the impact of intellectual potential which a university possesses including its international scientific recognition.

Also interesting is a methodology for assessing the intellectual potential of a university proposed by Russian scientists T. Bronnikova & I. Zuntova (2015). The above-named authors emphasize that, for purposes of effective management of a university's intellectual potential producing intellectual resources for businesses, it is necessary to have an integral assessment indicator. The set of indicators proposed by the authors to calculate the integral index of university intellectual potential is presented in Table 3.

Table 3. Indicators for the Calculation of the Integral Index of University Intellectual Potential

Indicator	Weight factor	Units
Adjusted number of faculty	0.25	persons
Funding for research and development	0.25	million Rubles
Number of citations of publications by faculty members	0.30	items
Image of the university. Applicants accepted to the university	0.10	persons
Image of the university. Employment of graduates	0.10	%

The idea of the proposed methodology is to match the weighted average assessments of individual indicators based on the weighted factors determined by an expert-review method.

System of Indicators and Methods of Assessing the Effectiveness of the Use of Intellectual Potential by a University

Because not all assessment indicators of production and commercial circulation enterprises can apply to universities, the authors of this article have endeavored to develop their own methodological approach to the evaluation of the intellectual potential of a university based on the study of pertinent world experience.

The approach proposed by these authors is based on the following principles:

1) the object of assessment should be not the potential itself or its dimension but its level of development, the degree of use of the potential, the effectiveness of its functioning;

2) assessment of the effectiveness of use of a university's intellectual potential should be arranged by using monitoring as a means of obtaining information required to take effective management decisions. The target of such monitoring, i.e. potential effectiveness, is characterized by a system of meaningful indicators which should be compiled based on a totality of the scientifically reasoned features of the object of monitoring;

3) the system of indicators used for assessment should on the one hand reflect the specifics of the structure of a university's intellectual potential and, on the other hand, should be based on the university effectiveness monitoring indicators developed by the Ministry of Education and Science of the Russian Federation.

The main steps for monitoring the effectiveness of the functioning of a university's intellectual potential are as follows:

- substantiation of methodological approaches to the organization and conduct of monitoring, including the definition of principles, problems, goals and tasks of monitoring, description of indicators and monitoring target specifics;
- determining which entity will conduct monitoring;
- defining methods and frequency of collecting data, the description of ways of data analysis;
- data collection, compilation and interpretation, forecasting of possible changes in the functioning of the intellectual potential;

- presentation of the results of monitoring which includes conclusions and recommendations for the taking of proactive management decisions, appropriate strategy and tactics of university development.

We determine that the requirements for the development of criteria for the selection of indicators characterizing the effectiveness of the intellectual potential of a university include:

- a full assessment of all the relevant characteristics and results of the use of potential;
- correspondence to the system of values and goals of the university in the short- and long term;
- impartiality and availability of source data;
- versatility;
- simplicity and ease of use;
- measurability, objectivity and comparability;
- prospective (forward-looking) nature.

It is expedient to conduct the assessment of the use of the intellectual potential of a university in the following areas:

- diagnostics of the effectiveness of using the potential of a particular university over time;
- comparative analysis of the effectiveness of using the potential of a reference group of universities in the framework of the relevant period;
- comparative analysis of the effectiveness of using the potential of a reference group of universities over time;

It seems to us that these principles should be the basis for the development of methodology for assessing the effectiveness of the use of the intellectual potential of universities.

A comparative analysis of the methodological approaches to evaluating the effectiveness of universities' intellectual potential enabled these authors to develop the following methodology. Table 4 presents a system of indicators for the calculation of the integral index of effectiveness of use of the intellectual potential of a university.

The methodology consists in the derivation of the integral index of effectiveness by summing up the weighted values of the indicators previously translated into scores to ensure the comparability of different-size indicators. The growth of the integral index would indicate an increase in the effectiveness of use of the intellectual potential of a university, and vice versa. The indicators themselves chosen by us for inclusion in the system are based on the system of indicators for monitoring the effectiveness of higher education institutions developed by the Ministry of Education and Science of the Russian Federation. Scores are usually assigned using an expert-review method.

The weighted values of the indicators were determined by the authors using an expert-review approach with regard to the requirements and criteria for global competitiveness. Global university rankings may serve as such criteria as they have become an instrument of social and global assessment of the quality of scientific and educational activities of Russian universities. In the United States, Europe and even in developing countries, such ratings have gained the features of global guidelines for improving the competitiveness of universities. As Russia's universities are facing the task of becoming significant players in the international education market, their participation in the global rankings

becomes mandatory and a prerequisite for participation in the competitive competition ongoing in the international educational space.

Table 4. System of Indicators for the Calculation of the Integral Index of Effectiveness of Use of the Intellectual Potential of a University

Indicator	Weighted factor	Units	Indicator interpretation
Ratio of the number of faculty members to students	0.20	persons	The ratio of the number of the teaching staff and the presented number of students characterizes the ratio of the two most important elements of the intellectual potential of a university interacting in the delivery of educational services, the potentials of the teaching staff and the student body
Employment	0.10	%	Demand for university graduates by employers characterizes the quality of training of graduates
Number of citations in the index system Scopus and Web of Science per 100 of faculty members	0.25	units	Cited scientific publications characterizes the academic reputation of the university's teaching and academic staff, including such reputation within the global international scientific and educational community
Number of citations of articles in the Russian Science Citation Index (RISC) per 100 of faculty members	0.15	units	
Income from R&D per one faculty member	0.10	thousand Rubles	Yield on the research and development activities of university academic and teaching staff characterizes their market demand, including international market demand
Amount of funds received for R&D by a university from foreign citizens and foreign legal entities per one member of faculty	0.20	thousand Rubles	
Integral indicator	1.00	Total effectiveness of the intellectual potential of the university	

Source: Own results.

The most prestigious international rating system is the QS World University Rankings which has been selected by Russian specialists on education as a base for positioning of national universities. In compiling this ranking universities are rated on six criteria:

1) academic reputation – accounts for 40% of the overall assessment;

2) employers' attitude towards university graduates (employer reputation) - 10% of the overall assessment;

3) the level of citations of publications by university faculty (citations per faculty) - 20%;

4) faculty to student ratio – 20%;

5) proportion of international students – 5%;

6) proportion of international faculty – 5%.

A group of Russian scientists conducted a comparative analysis of the methodology and criteria for the composition of the global QS World University Rankings and the national rankings compiled based on the system of monitoring

the effectiveness of higher learning institutions promoted by the Ministry of Education and Science of the Russian Federation.

The study led to the conclusion that a number of indicators/criteria of the above ratings are direct analogs and that the methodology of forming the basis of national and global rankings of universities reflecting their level of competitiveness is based on the same type of principles and unidirectional indicators (Bragin, Selyanskaya & Stukalova, 2014).

Monitoring the effectiveness of the use of the intellectual potential of a university should be contracted by the university administration and the department responsible for the development of strategies and programs. Such monitoring must be conducted by a department that carries out forecasting and analytical work.

The frequency of monitoring is determined by the periodicity of the collection of analytical source data. In this case, it is advisable to conduct monitoring once a year as the publication of the official results of monitoring the effectiveness of higher education institutions conducted by the Ministry of Education and Science of the Russian Federation takes place. Accumulation of information over a number of periods will allow the university to predict the value of the integral index in the long term.

Testing of the System of Indicators and Methods of Assessing the Effectiveness of the Use of University Intellectual Potential

The methodology for assessing the effectiveness of the use of intellectual potential was tested on data pertaining to Russia's leading universities.

The results of measuring the dynamics of the effectiveness of use of the intellectual potential of the Russian G.V. Plekhanov University of Economics are presented in Table 5.

The initial data for the analysis are the results of monitoring the effectiveness of higher education institutions conducted by the Ministry of Education and Science of the Russian Federation in 2013 and 2014, respectively. Analysis of the integral index of the effectiveness of the use of intellectual potential of the Russian G.V. Plekhanov University of Economics showed a certain decrease in 2014 which is due largely to a merger with the Russian Trade and Economic University which is deemed ineffective.

The suggested methodology allows carrying out a comparative analysis of the effectiveness of the use of intellectual potential by a group of universities in the framework of the relevant period. To carry out such a comparison, the earlier declared principle of comparability must be observed. For the purposes of such comparison, it is necessary to select universities with the same profile or having the same status and comparable scope of activities.

Table 5. Dynamics of the Integral Index of the Effectiveness of the Intellectual Potential of the Russian G.V. Plekhanov University of Economics*

Indicator	2013	2014
Ratio of the number of teaching staff and students		
absolute value, persons	0.092	0.075
score	10.00	8.12
weighted score	2.00	1.62
Employment:		
absolute value, %	98.804	99.841
score	9.90	10.00
weighted score	1.98	2.00
Number of citations in the index system Scopus and Web of Science per 100 of faculty members:		
absolute value, units	15.49	19.58
score	7.91	10.00
weighted score	1.98	2.50
Number of citations of articles in the Russian Science Citation Index (RISC) per 100 of faculty members:		
absolute value, units	108.22	291.55
score	3.71	10.00
weighted score	0.56	1.50
Income from R&D per one faculty member:		
absolute value, thousand Rubles	177.81	136.68
score	10.00	7.69
weighted score	1.00	0.77
Amount of funds received for R&D by the university from foreign citizens and foreign legal entities per one member of faculty:		
absolute value, thousand Rubles	2.907	1.011
score	10.00	3.48
weighted score	2.00	0.70
Integral indicator	**9.52**	**9.09**

**Source: the absolute values of indicators are calculated on the basis of data of monitoring the effectiveness of educational institutions of higher education by the Russian Federation Ministry of Education and Science: available online at <http:// indicators.miccedu.ru/monitoring>, retrieved on 09.05.2016.*

To test the methodology, the authors selected three federal universities which are the leaders of the national rating of universities and listed in the QS ratings and also belong to the same reference group: The Ural Federal University (UFU), the Far Eastern Federal University (DFU), the Kazan (Volga) Federal University (KFU). Absolute values of indicators are taken from a monitoring survey of the effectiveness of higher learning institutions conducted in 2015. The results of calculations are presented in Table 6.

The comparative analysis of the integral index of effective use of the intellectual potential of the analyzed federal universities in 2014 led to the conclusion that the Kazan Federal University had a higher return potential.

Table 6. Comparative Analysis of the Integral Index of the Effectiveness of the Use of Intellectual Potential by the Federal Universities*

Indicator	UFU	DFU	KFU
Ratio of the number of teaching staff and students			
absolute value, persons	0.013	0.106	0.094
score	8.84	9.41	10.69
weighted score	2.00	1.88	1.66
Employment:			
absolute value, %	85.00	70.00	85.00
score	10.00	8.24	10.00
weighted score	1.00	0.82	1.00
Number of citations in the index system Scopus and WebofScience per 100 of faculty members over 5 years:			
absolute value, units	169.48	156.06	523.96
score	3.23	2.98	10.00
weighted score	0.81	0.75	2.50
Number of citations of articles in the Russian Science Citation Index (RISC) per 100 of faculty members over 5 years:			
absolute value, units	131.61	184.33	141.72
score	7.14	10.00	7.69
weighted score	1.07	1.50	1.15
Income from R&D per one faculty member:			
absolute value, thousand Rubles	315.10	343.84	422.98
score	7.45	8.13	10.00
weighted score	1.49	1.63	2.00
Amount of funds received for R&D by a university from foreign citizens and foreign legal entities per one member of faculty:			
absolute value, thousand Rubles	19.64	0	2.351
score	10.00	0	1.2
weighted score	1.00	0	0.12
Integral indicator	**7.37**	**6.58**	**7.43**

**Source: the absolute values of indicators are calculated on the basis of data of monitoring the effectiveness of educational institutions of higher education by the Russian Federation Ministry of Education and Science: available online at <http:// indicators.miccedu.ru/monitoring>, retrieved on 09.05.2016.*

Discussion and Conclusion

We share the position of S. Levitin (2011) who proposes to consider a university as "an independent economic entity… as an organization acting on the market of professional services - training, consulting, design and other services". We agree that universities are organizations conducting education activities, research activities within a broad profile spectrum. Therefore, they are agents on two markets at once: the market of education services and the market of research and development (R&D) work. The main products of university activities are education programs and results of R&D.

Also, universities are labor market entities and supply its product on this market as graduates. Meanwhile, the quality, i.e. qualification of a university graduate, and how much he or she is in demand on the labor market depend no

so much on the university as on his or her own input in the education process and on the level of his or her own intellectual potential. In this context, universities should be viewed as a source of formation of the intellectual potential of organizations.

Most researchers dealing with the problem of the potential propose to single out only two elements which are part of the intellectual potential of a university: the potential of the university personnel (faculty) and the scientific potential of the university itself. In general, this approach seems to be valid. It is fully based on the opinion of researchers who recognize that any university is the subject of two markets: education services and R&D (Shehzad et al., 2014; Secundo et al., 2015).

It is also pertinent to point out that the position of T. Bronnikova & I. Zuntova (2015) is close to our vision of the structure of university intellectual potential. For the purposes of scientific interpretation of the results of assessing the level of components of the intellectual potential of universities, the authors developed weighting factors assigned to a particular university potential indicator depending on its value. For example, the level of education was assessed by using five criteria, each of which is assigned a weighted factor depending on its importance and the degree of influence on the formation of the intellectual potential of universities.

In our opinion, the advantages of the proposed methodology are the following:

- assessment targets the impact of the intellectual activity of a university;
- focus on the indicators used in methodologies offered by the Ministry of Education to monitor the effectiveness of higher education institutions.

But we can note that the most important benefit of the proposed method is the usage of a university's image indicators, quantified by the ability of the university to attract students and ensure employment of graduates.

Can state that the determining factor in the growth of the competitive position of a university and its effectiveness is the degree of development of the intellectual component in the overall potential of the higher education institution.

In summary, the specific features of the development of a university's intellectual potential are as follows:

- higher education itself is a highly intellectual sector of the economy;
- the structure of a university's intellectual potential combines intellectual resources of the subjects and objects of scientific and educational activities of the university and its strategic partners;
- the specificity of educational services provided by a university is determined by the participation of students in their production.

In view of the above, the structure of a university's intellectual potential comprises three components: the potential of scientific and pedagogical workers (university faculty), the potential of students and the potential of the university itself, including its intellectual property in the form of intangible assets, marketing and infrastructure assets.

The methodological approach proposed by these authors, in contrast to the other now existing approaches, allows researchers to monitor the effectiveness of the functioning of university intellectual potential in the following areas:

- diagnostics of the effectiveness of the potential of a particular university over time;
- comparative analysis of the effectiveness of the potential of a reference group of universities in the framework of the relevant period;
- comparative analysis of the effectiveness of the potential of a reference group of universities over time.

Implications and Recommendations

The methodology for assessing the effectiveness of use of the intellectual potential of universities was tested on the example of Russia's leading universities incorporated in the QS World University Ranking. This assessment methodology is versatile and can be applied not only to Russian but also to foreign universities.

Disclosure statement

No potential conflict of interest was reported by the authors.

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