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Dynamic Estimation of Significant Factors of Forming a University Ranking in the Context of Transition to an Information Society

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Abstract

The paper draws attention to the comparative dynamics of university ranking factors for the last five years (2013-2018). The period under review is characterized by an active transition to the information society. The article deals with a relevant problem of identifying factors in the educational organization ranking formation. These factors are significant in the period of transition to an information society. The aim of the research is development and pilot approbation of the author's algorithm of dynamic subject-oriented analysis on factors forming a ranking of an educational institution. The basic methods of this research include: factor analysis for the university ranking formation, theoretical and experimental substantiation of the author's algorithm of dynamic subject-oriented analysis, statistical methods of comparison of teachers and heads of educational organizations, a uniform experimental basis of interpretation and prediction of dynamics of the ranking reflection in the organization's information environment. The author's algorithm is based on the mechanisms of factor analysis of subjective representations. The dynamic basis of the author's algorithm includes the analysis of stability and sustainability of the considered factors observed in the questionnaire surveys conducted in the period from 2013 to 2018. The poll respondents were 150 leaders and pedagogical staff of technical schools and colleges of the Russian Federation. The subjective focus of the author's algorithm consists of separate opinions of teachers and managers on the educational organization ranking. The significance of a number of factors in the ranking structure, which remain relevant for five years, is confirmed. Among such factors are: the developed information and educational environment, the faculty capacity, the number of accredited specialties and the issuance of degree certificates. The ranking structure revealed the most dynamic positions with a high significance and output beyond the limits of the previously established statistical deviation. In addition, there are factors, the priority of which has been identified recently, for example, the factor of demand by entrants, recommended by the management, and the factor of research activity that was recommended by teachers. The predicted changes for the near and distant future were also revealed. We draw a conclusion about the applicability of the proposed algorithm to identify common factors. The role of education system actors in the formation of university rankings is determined. In the open information environment the algorithm contributes to dynamic forecasting for the near and distant future.

Keywords: educational organization ranking; significant factors; analysis algorithm; education system actors.

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Introduction

The article deals with the comparative dynamics of university ranking factors for the last five years (2013-2018). The period under review is characterized by an active transition to the information society. In this context the model of ranking formation undergoes changes. The accessibility and openness of information are brought to the fore in the educational system, in which all categories of actors are involved.

Purpose and objectives of the study

The aim of the research is development and pilot approbation of the author's algorithm designed for analysis of dynamic subject-oriented factors involved in the university ranking formation.

Literature review

One of the indicators of the university success and its reputation in the scientific world is a ranking. So not only the absolute values of university achievements are considered important, but also achievements of other participants in the market of educational services and scientific interests. The answers to this question are offered by different ranking systems of educational organizations. The topic on rankings of educational institutions and their success are revealed in works of Shattock (2010) and Kibanova (2010). University leaders try to take into account many factors and manage by analyzing their influence or building, for example, a quality management system described in works of Kanji (1999) or an information and educational system that determines the success of innovation (Henner, 2014). This issue is also noted in the works of Disterheft (2012) who studied implementation of Environmental Management Systems (EMS) in European higher education institutions and Zarubina (2016) who studied the optimization of these factors. Kirilova, Vlasova (2016) justified the university management based on creating a pedagogical design through logistic flows. A comparative analysis of the use of ICTS in education for different parts of the world is presented in the studies of Kozma (2008). Despite the potential benefits of introducing computer systems into the educational environment, it is necessary to identify factors that have a greater impact on the successful implementation of such technologies. This fact was proved by Tolmie and Boyle (2000). The problems of gaining additional benefits by creating high-tech products on the basis of higher educational institutions was described by Sternberg (2014) or links of educational institutions and industrial productions (Plewa et al., 2013). Russian scientists Batrakova and Bordovskiy (2009) noted that the improvement of teachers' qualification becomes a factor of the university development. The meta-analysis of factors using the weights of training strategies is presented in the works Schroeder et al. (2007). The analysis of modeling and transformation scenarios is presented in the works of Bowe, Ball & Gold (2017). Verger (2014) studied a varying role of ideas in education. The works of Kopyrin (2008) were also based on the management of the chosen scenarios as a tool for prediction of a system development.

Methodology

The basic methods of this research include: factor analysis for the university ranking formation, theoretical and experimental substantiation of the author's algorithm of dynamic subject-oriented analysis, statistical methods of comparison of teachers and heads of educational organizations, a uniform experimental basis of interpretation and prediction of dynamics of the ranking reflection in the organization's information environment.

The author's algorithm is based on the mechanisms of factor analysis of subjective representations. The dynamic basis of the author's algorithm includes the analysis of stability and sustainability of the considered factors observed in the questionnaire surveys conducted in the period from 2013 to 2018. The poll respondents were 150 leaders and pedagogical staff of technical schools and colleges of the Russian Federation. The subjective focus of the author's algorithm consists of separate opinions of teachers and managers on the educational organization ranking.

The following factors were analyzed. The analysis of some of them was presented in works of foreign scholars: guarantee of employment of graduates, salary level of future specialists, development of information and educational environment were described in works of Tolmie & Boyle (2000) and Watson & Tinsley (2013); faculty staff capacity, the number of accredited specialties, availability of nationally recognized documents, relevance of applicants, implementation of research activities, introduction of innovations in the educational process noted by Borras & Edquist (2014); federal testing results, the number of students, availability of additional educational services were mentioned by Langen (2011).

Results

The author's algorithm of analysis on the dynamics of factors included in rankings was substantiated and experimentally tested. This algorithm allows defining the categories of subjects which have made a decisive influence on the change of significance of certain factors.

The main results of approbation of the author's algorithm consist of the following. The significance of a number of factors in the ranking structure, which remain relevant for five years, is confirmed. Among such factors are: the developed information and educational environment, the faculty capacity, the number of accredited specialties and the issuance of nationally recognized certificates.

The ranking structure revealed the most dynamic positions with a high significance and output beyond the limits of the previously established statistical deviation. First, it is an increasing role of innovation in the educational process, which is important for the transition to the information society. Secondly, job guarantees and the salary level of future specialists makes less influence on the ranking.

The priority factors are revealed. First, it is a factor of demand by applicants accounting of which contributes to the position of management. Secondly, these are factors of research activities and the availability of additional educational services, which are facilitated by the position of teachers.

Predicted changes have been identified, accompanied by a significant increase in the importance of several factors. These are a leadership role of students and the importance of federal testing results, which is significant for teachers.

Table 1. The importance of factors for educational institution ranking

Factors	Research Period		Subjects of Education	
	2018	2013	Teachers	Managers
Similarity				
Employment of graduates	53	79	76	83
Salary level of future specialists	53	65	57	75
Development of information and educational environment	75	72	69	75
Faculty staff capacity	80	75	66	88
Number (range) of accredited specialties	73	73	76	68
Availability of nationally recognized documents	80	83	86	79
Difference				
University popularity (Applicants' demand)	80	52	47	58
Research activities	67	41	47	33
Implementation of innovations in the educational process	67	54	53	57
Results of federal student testing	33	18	22	13
Number of students	47	30	28	32
Availability of additional educational services	60	48	50	43

Discussions

When assessing the importance of factors of the educational institution ranking formation, it is worth mentioning that the presence of state documents provided by one or another university remains the leading one. This factor is an echo of 2000s when there was a large number of universities that issued diplomas with a poor quality of education because the state did not have time to control the quality in all universities. It also shows that teachers and students are prone to choose state universities.

The greatest stability of judgments about the significance of factors investigated by us can be noted with regard to a number of accredited specialties. This is due to the fact that the university ranking

does not strongly grow in the eyes of applicants, i.e. the availability of various university courses does not affect the quality of education in one specialty (e.g. technical). However, large higher education institutions usually have a wide range of courses and therefore they are more recognizable.

The "faculty staff capacity" factor not only remained stable on the high position, but in 2018 it was among top three. The "human factor" still plays an important role in the education system and it is interesting that university leaders understand this better, i.e. they are better judges on the quality of education meanwhile teachers underestimate their role.

The difference in the estimation of such factor as "salary level of future specialists" between administrators and teachers can be explained by the fact that teachers are by nature more conservative and they have a propensity to stability (employment, wages, albeit low) while the leaders are not only researchers and lecturers, but also partly managers and in these circles the salary level is an indicator of the efficiency of work and professional success.

Such an indicator as the development of the information and educational environment has lost its position in 2018 compared to 2013. This suggests that the average level of universities development in this aspect has grown and now it is perceived as something that will be guaranteed to meet the expectations of university applicants. Also, it is necessary to note that the graduates employment factor has sharply lost its position. It is proved by the fact that in the current economy globalization process a sufficient level of knowledge of graduates and the guarantee of employment ceased to be significant factors for building a successful career in the future.

The popularity of universities by students at the same time moved upwards which indicates the deliberation of decision-making and orientation to the experience of previous applicants and the market economy laws. However, it should be logically recognized that university rankings in the present cannot be effected afflicted by the economic problems in the future.

The increase in the factor of research activity in 2018 is explained by the fact that over the last 5 years the state began to pay more attention to the university recognition abroad: H-index and papers in Web of Science and Scopus journals have become the indicators (KPI) for universities and teachers (Project 5-100).

The implementation of innovations has become a significant factor as the pace of development has increased and if someone does not follow the trends of education he or she can be left behind without opportunity to catch up since the technology and information environment are exponentially develop.

The federal testing results though showed almost double growth but remained insignificant. For this factor such behavior is typical as tests are held regularly by the state and it is also worth noting that in 2013 they were held in a smaller number of universities.

The "number of students" factor is important, since it speaks naturally about the greater stability of the system consisted of more components. But also it is a result of the university popularity, because successful universities displace competitors from the market.

Conclusion

To sum up, we can to make a conclusion about applicability of the suggested algorithm for revealing the most stable factors in the ranking of educational organizations and compare the opinions of university leaders and teaching staff.

All this allows judging about the role of educational system actors in the formation of university rankings and its current reflection in the open information environment. The suggested algorithm promotes

dynamic forecasting for the nearest and distant future.

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