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Indicators of research activities in the national university rankings of European countries: weight and content

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Abstract. The article is devoted to the research of the weight and content of the scientific component in the national ranking of European universities. Regularities and peculiarities of evaluation of scientific sphere in national rating systems of Great Britain, Germany, France, Italy, Spain, Poland and Ukraine have been analysed. The groups in which it is reasonable to combine the indices of scientific research have been singled out, and the directions which have the most powerful representation have been determined. Depending on the purpose of the rating, clusters with a markedly different share of indicators of scientific activity in the overall rankings have been singled out.

Keywords: *research activities, evaluation, indicator, national university rankings*

Introduction. Evaluation of various aspects of the functioning of the system of higher education through the rankings plays a significant role in its development. Today, almost no one questiones the feasibility of a comparative analysis of the universities in the global and national scale. Obviously the role of competition in higher education will grow substantially. The growing number of international ranking schemes testifies to the increasing competition [15, p. 20], therefore academic establishments will be ranked accordingly, especially nationally, in addition to their research-based global rankings [6, p. 225].

Research work occupies a significant place among the main activities of the university. The scientific activity of the modern university is multifaceted, carried out in many directions, and the results are marked by a great diversity both formally and by substance. An important place is occupied by the research at European universities. They are reflected in the relevant indicators of national rankings. However, the list and the substance of these indicators are quite diverse. Therefore, a comparative analysis of the scientific component of national ranking systems of European countries is seen as an actual problem.

Overview of publications on the topic. Interest in education performance has rocketed since the publication of the first global ranking, the Academic Ranking of World Universities in 2003 [4, p. 1]. Now global rankings is a powerful device for framing higher education on a global scale [9, p. 130]. World rankings are one means for nations to judge how well they are doing in the competitive global knowledge stakes [10, p. 63], but world rankings are not able to assess the work of most universities around the world. To some extent, this justifies the need to establish and explain the growing importance of national rankings.

Within national systems, the rankings have prompted the desire for higher ranked universities both as symbols of national achievement and prestige and as engines of economy knowledge growth [9, p. 123]**.** According to the data presented by Hazelkorn [4, p. 2], in 2009 the national rankings already existed in more than 40 countries. Herewith, national rankings are usually able to capture data across a wide range of dimensions while global rankings are inevitably more narrowly proscribed [5]. Currently, there is a large number of national rankings. The list of parameters that characterize the scientific activity strongly depends on the purpose of rankings. In addition, the systems of higher education in different countries have significant differences. Therefore the experience of ranking evaluation of European universities is more useful.

Rankings are an inevitable manifestation of globalization [4, p. 11], but their role should not be exaggerated. So far, rankings cover only some of the university's mission. They use different values and often choose such parameters that are difficult or impossible to measure. Other complaints relate to the transparency of ranking methodologies [14, p. 21]. Many myths are promulgated about the value of rankings for policymaking or strategic decision-making. However, rankings should be used cautiously [5].

Scientific research is an integral part of the process of training. Along with the training and transfer of knowledge (innovation) research is at present the main mission of universities [2].The increasing recognition of the importance of research at once elevates the importance of higher education institutions [10, p. 58]. Kwiek [6, p. 224] believes that the distinctiveness (and attractiveness) of European higher education has traditionally been its ability to combine the two core missions (teaching and research). Helpful in solving many of these problems can be a developed complex system of ranking evaluation of universities at the national level, in whatever the indicators of scientific activity are figured prominently.

Goals. The article aims at elucidating the assessment evaluation of the research area in national rating systems, investigating the peculiarities of the content of scientific activity and determining their importance in the overall ranking.

Materials and methods. The paper studied the national university rankings of certain European countries concerning the entity's indicators of scientific activity. Widespread methods (measurement, comparison, analysis and synthesis, ordering) and more specific (cluster analysis) ones have been used.

Results and discussion. National ranking systems use a wide range of indicators to measure research. Let us consider the major national rankings of European countries by using primarily their research component.

League tables and rankings are an integral part of the university sector in the Great Britain. Many newspapers prepare their ranking, using different assumptions and weights. The ranking The Complete University Guide [16], printed in The Independent, uses 9 evaluation criteria. Scientific research has direct bearing on one criterion - evaluation studies (15%). Partly scientific components include student satisfaction index, taking into account the

availability of qualified teaching staff, and the ratio of teachers to students.

Similar criteria and approaches specific to the ranking Good University Guide, which are published in The Sunday Times and The Times [17]. In building the table [13] 8 criteria are used. Scientific research has direct bearing on one criterion – the research quality (17%). Partly scientific components include student satisfaction index, taking into account the availability of qualified teaching staff, and the ratio of teachers to students. League table of the newspaper The Guardian is focused primarily on the applicants. Now the table is formed using 9 indicators [18]. The methodology does not include direct measurement of research results. Indirect relationship to science have such indicators as national survey of students of teaching, the ratio of staff to students and the National Student Survey overall satisfaction of students.

In Germany the country's most authoritative institution in the ranking assessment of universities is Centre for Higher Education [CHE], which offers the latest university rankings. CHE Ranking covers several areas, one of which is CHE-HochschulRanking. CHE rankings do not define a specific ranking position, but only include universities in three different groups. CHE-Hochschul Ranking was designed primarily to meet the needs of students. Since 2005 the findings have been published by the magazine Die Zeit.

The last option of CHE University Ranking [3] includes up to 37 different benchmarks. For the evaluation of scientific activity there is a separate module, which uses the following parameters (group performance): citations per publication, doctorates, internationally visible publications, inventions per 10 scientists, publications, research, research quality, research reputation, third party funds. To other modules there are included also the indicators that indirectly characterize scientific activities, such as foreign guest lecturers, result doctors preliminary examination, research orientation, students per scientist, students per teacher, teaching professors, type of a degree course (a postgraduate course).

In France, the media are the rankings producers of universities and colleges, among major journals there is Le Nouvel Observateur. As described in Le palmarès Grandes écoles [7] ranking methodology authors classify the data in 8 criteria for determining the final ranking. Individual criteria, which would describe research, is not released by the authors. The indicators that take into account agreements with foreign institutions, flexibility and diversified curriculum are indirectly relevant to the research activities; it includes in particular a partnership with French universities, schools and friendly schools, taking into consideration the pupil-teacher ratio.

In Italy, media take care of concluding rankings of national universities, including publication La Repubblica. According to approaches described in Nota metodologica [11] in assessing public universities ranking uses 5 criteria. Among the 11 indicators related to the research activities there is one – the number of seats in research laboratories. It is part of the criterion of 'structure'. Partly to scientific component there is the university ranking cite, which is defined on its functionality and includes the analysis of research results.

Making the rankings in Spain has been recently carried out occasionally, as most students prefer local universities there. Today, one of the most influential Spanish newspaper El Mundo regularly publishes university rankings Spain 50 carreras [1]. Among the 25 criteria for which the data is submitted by universities, research activities directly characterize the number of research projects, participation of teachers in research, manufacturing (preparation) of scientists, and indirectly – the proportion of students in relation to teaching and research staff and results in international rankings. In addition, the survey of teachers form an opinion including the results of its research.

In Poland, the most authoritative ranking is formed by the specialized educational publisher Perspektywy, which publishes the results in particular in the newspaper «Rzhech Pospolyta». Ranking of Perspektywy [12] actually includes 5 rankings. One of the most important, of course, is the academic ranking of universities, which includes six criteria. 2 criteria are entirely devoted to measuring scientific activities, such as research capabilities, which includes indicators such as parametric ranking (6%), doctor (2%) and Ph.D. (2%) thesis, saturation staff persons of higher qualifications (3%), accreditation (2%), and effectiveness research that includes such factors how to replenish its own staff (8%), providing academic degrees (7%), the efficiency received external research funding (4%), publications (2%), citing (3%), the index of Hirsch (3%), attended university in the EU Framework Programme 7 (2%), doctorate (1%), patents (2%).

Indirectly relevant to the research activities are indicators such as rankings of professors (11%) of EU funds for projects (2%), international recognition, which is measured by the position of universities in the world rankings (2%), availability of qualified staff (5%), opportunity to develop research interests (1%), university professors from abroad (1%), an innovative university facilities (1%).

The most authoritative university ranking in Ukraine, which is prepared by an NGO, is a project of the «Top-200 Ukraine». In the basic methodology [8] the activity was determined by three complex criteria (index). Indicators that directly measure the scientific activity (mostly scientific potential) are concentrated in the criteria of 'quality of the teaching staff'. Among them – the number of selected academics (22%), and corresponding members (10%) of the National Academy of Sciences of Ukraine, academicians (6%), and corresponding members (3.3%), state-supported academies of sciences of Ukraine, the number of doctors (2.5%) and Ph.D. (0.5%), the number of patents, industrial designs, utility models (0.5%).

Indirectly the scientific work is described by the number of full-time employees who were awarded the State Prize in Science and Technology (2%), the number of students – winners of international (7.5%) and national (1.5%) contests (competitions), the scale of the university, level of training and research facilities (14%), membership in various universities international Association of Universities (total 12%).

The range of indicators of scientific activity of national University rankings of European countries is more extensive and diverse than the global counterparts. So, let us analyze them in pre-systematic form. We distinguish the following groups of indicators:

– the quality of academic and research staff [QARS] is usually characterized by a number or proportion of teachers with degrees and (or) academic ranks relative to the total number of teachers or students;
– preparation of the teaching staff [PTS] involves proposal of doctoral programs (number and range), manufacturing (preparation) of scientists (the number of defended theses), the number of postgraduates (people working for doctor's degrees);
– index of publications [Publ] usually includes their number. This often takes into account only a certain category, such as internationally visible publications, primarily - in international scientometric systems;
– indicators citation [Cit] is traditionally formed by using global scientometric databases (Scopus, Web of Science) and recognized quotation systems. It identifies both absolute and relative performance;
– research and projects [R&P] are evaluated by many ways. They usually include the total number of research projects of innovative facilities, seats in scientific laboratories, the level of research base. Attempts are made to assess the quality of research and their performance. Noticeable attention is paid to the financial side of research activities in its various aspects;
– patents and licenses [PL] is measured traditionally by the number (general or with respect to the number of teachers) inventions, patent-protected rights and licenses;
– international scientific activity [ISA] is usually characterized by the participation in international research projects, the number of international agreements and cooperation with foreign scientific and educational institutions. The university's membership in various international associations of universities, the numbers of foreign teachers are also considered.

In national rankings many additional parameters [AP] are included, which indirectly characterizes scientific activity. Most common among them is the place of universities in national and global rankings. Rankings University site, the opportunity to develop research interests, student satisfaction and others are also considered. Summary data on the display of indicators of scientific activity in the national university rankings of European countries are shown in Table 1.

Table 1. Indicators of Research Activities in the National Rankings of European Universities

№	Ranking	Indicators Groups							
		QARS	PTS	Publ	Cit	R&P	PL	ISA	AP
1	The Independent (Great Britain)	+				+			+
2	The Times and The Sunday Times (Great Britain)	+				+			+
3	The Guardian (Great Britain)	+							+
4	CHE-HochschulRanking (Germany)	+	+	+	+	+	+	+	
5	Le Nouvel Observateur (France)	+						+	+
6	La Repubblica (Italy)					+			+
7	El Mundo (Spain)	+	+			+			+
8	Perspektywy (Poland)	+	+	+	+	+	+	+	+
9	Top-200 Ukraine (Ukraine)	+				+	+	+	+

National ranking systems, with regard to publications, citation, international research activity and training of the teaching staff, still make the emphasis on the account of the scientific and research personnel and analysis of various aspects of the implementation of scientific research and projects. Separate ranking systems evaluate as well patent and licensing activities and take into account the position of the university in national and global rankings.

Indicators of scientific activity are prominent in national rankings of universities. In previous work [13] the proportion of indicators of scientific activity of national university rankings of UK was determined, which are promulgated by such editions as The Independent, The Sunday Times, The Times and The Guardian. It is worth mentioning that the scientific component of many indicators contains in an implicit form or combined with other areas of the university activity. Therefore, in some cases, the proportion of indicators of scientific activity in different ratings can be determined approximately enough that at the same time allows for a completely correct comparative analysis. Of course, it is difficult to precisely determine the proportion of indicators that directly or indirectly characterize scientific activity. In some cases, for such an analysis it is necessary to have some decision – assumption of equal importance of different modules (criteria) and the same weight of different indexes within a module (criteria), if such information is not cited by the authors. Such peculiarity of evaluation of scientific activity will be taken into account in determining the proportion of indicators that directly or indirectly characterize the scientific scope of European universities. Summary results are shown in Table 2.

Table 2. Indicators Share of Scientific Activity of National University Rankings of European Countries

№	Ranking	Indicators of scientific activity (%)		The scientific component share, total (%)
		Direct	Indirect	
1	Perspektywy (Poland)	47	8	55
2	Top-200 Ukraine (Ukraine)	38,8	8,2	47
3	The Times and The Sunday Times (Great Britain)	17	5	22
4	The Independent (Great Britain)	15	5	20
5	CHE-HochschulRanking (Germany)	12,5	4,5	17
6	La Repubblica (Italy)	9	3	12
7	El Mundo (Spain)	6	6	12
8	The Guardian (Great Britain)	0	8	8
9	Le Nouvel Observateur (France)	0	7	7

A comparative analysis reveals the two clusters – the national university rankings of the UK, Germany, France, Italy and Spain, where the weight of the scientific component is 7-22%, and national rankings of universities in Poland and Ukraine, where the performance share of scientific activity is more prominent (or even defining) and is within 47-55%. Obviously this is due to the fact that in countries with established market mechanisms of higher education system such rankings are oriented normally to prospective students, their parents, employers, so focusing on the educational activities of the university. If the drafters of the ranking foresee that the results will be used in governance, the weight of scientific component of the rankings will significantly increase.

Conclusions. Thus, the indicators that directly or indirectly characterize scientific activity are present in all national rankings of European universities examined in this paper. They are characterized by a great diversity, therefore in order to be correctly analyzed they should be united into such groups: quality of academic and research staff, training of the teaching staff, publications, citation, research and projects, patent-licensing, international scientific activities, additional indicators. It has been established that national rating systems mainly focus on making quality evaluation research staff and academic performance and projects. Many of these systems evaluation publications, citations, international research activities, and training of the teaching staff remain within the eyesight.

Determination of the proportion of indicators of scientific activity in the overall rankings can identify two clusters of national ratings, aimed at prospective students, their parents, employers (UK, Germany, France, Italy, Spain), in which the weight of scientific components is 7-22%, and calculated for use in management (Poland, Ukraine), where such weight is more prominent (47-55%). Usually reference to a specific index of a group can not always make clear. Sometimes the scientific component can be determined fairly approximate in terms of the complex nature. In some cases it is necessary to take certain assumptions, including unambiguous importance of different indicators within the module. However, this can not be an obstacle to form an accurate picture of the content and significance of indicators of scientific activity in national rankings of universities of European countries.

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Подолянчук С. В. Показатели научной деятельности в национальных рейтингах университетов европейских стран: значимость и содержательное наполнение

Аннотация. Статья посвящена исследованию значимости и содержательного наполнения научной составляющей в национальных рейтингах университетов. Проанализированы закономерности и особенности оценивания научной сферы в национальнимх рейтинговых системах Великобритании, Германии, Франции, Италии, Испании, Польши и Украины. Выделены группы, в которые целесообразно объединить показатели научной деятельности, и определены направления, которые имеют наиболее мощное представление. В зависимости от назначения рейтинга выделены два кластера с заметно разной долей показателей научной деятельности в общем рейтинге.

***Ключевые слова**: научная деятельность, оценивание, показатель, национальные рейтинги университетов.*