

Research on Research Performance Evaluation in Research Universities

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Abstract: This study discusses the related theories of research performance evaluation in research universities, and puts forward six basic principles that should be followed in the evaluation of research performance in research universities. On the basis of these evaluation principles, based on the actual situation of scientific research in research universities, the basic indexes are screened, and a set of evaluation index system of scientific research performance of research universities is constructed, and the detailed elaboration is carried on to each dimension. The purpose of this study is to effectively improve the management level of scientific research, promote the rational allocation of scientific research resources, and improve the academic development of research-oriented colleges and universities through performance evaluation.

1. Introduction

In today's knowledge explosion, the research activities of research universities not only cultivate high-level talents, but also provide impetus for the development of universities in the era of innovation. How to effectively improve the management level of scientific research, promote the rational allocation of scientific research resources and improve the academic development of research universities through performance evaluation is an urgent problem to be solved by the government and scholars at present. Therefore, research universities must establish a scientific and reasonable scientific research performance evaluation system in accordance with their own conditions.

Scientific research performance evaluation index system is the key to scientific research performance evaluation, but also the premise of scientific research performance evaluation. Only by designing a scientific and reasonable index system, can we get a correct and valuable evaluation conclusion. A good scientific research evaluation index system can describe the research evaluation object in detail, and can directly promote the development of scientific research evaluation. An unreasonable evaluation system of scientific research performance will directly lead to the deviation or even error of the evaluation results. Therefore, this study will be based on the previous related research, take its essence, discard the dross, according to the research object, research university Research conditions to build a scientific and reasonable scientific research performance evaluation index system.

2. The Basic Idea of Constructing the Index System of Scientific Research Performance Evaluation

Before we determine the evaluation index system of scientific research performance, we should first determine its guiding ideology, that is, the precondition of selecting indicators, that is, the whole process of scientific research activities in research universities will affect the development of scientific research level of universities. Therefore, the index system of scientific research performance should include the elements of scientific research activities.

At present, many scholars have established the evaluation index system of university scientific research. Although there are differences between them and there are no standardized and applicable models, but in the current evaluation work, The evaluation index system of scientific research performance has already been relatively scientific and complete^[1].if we want to re-establish a new set of indicators system, it will be quite difficult in technology, so, The research performance index

system constructed by the research institute is based on the related research results, aiming at the particularity of scientific research in research universities, some of the indexes are screened and integrated. Finally, the evaluation index system of scientific research performance in accordance with the actual situation of scientific research in research universities is determined. Of which, yes The process of determining the indicators and the basis for the establishment of the indicator system will be specified below.

This research mainly invites several experts who are authoritative in the related fields of education and management, and carries on the expert opinion consultation to the research university scientific research performance appraisal index selection and the index weight determination, in addition, The qualitative research method and the analytic hierarchy process (AHP,) are also adopted to analyze the opinions of the experts. Finally, a set of evaluation index system of scientific research performance of research universities is formed.

3. The Basic Principles of Design of Evaluation Index System for Scientific Research Performance

When we set up the evaluation index system of scientific research performance, we should not only consider the actual situation of the evaluation object, but also follow the basic principles of the design of the index system. The formation of scientific research performance index system is a very complicated process, so we should strictly follow certain design principles when designing index system.

3.1 Targeting principle

The research object of this study is the research performance evaluation of research universities, so when we design the index system, all the indicators are selected around this goal.

3.2 Principles of scientific reasonableness

The evaluation index system of scientific research performance in research universities should be scientific, true and objective to reflect the essential attributes of the evaluation objects, and the indicators can directly reflect the characteristics of the attributes of university scientific research.

3.3 The principle of systemic comprehensiveness

When selecting specific indicators, we should not omit the important indicators, we must be comprehensive and grasp the key points. For those indicators that are unnecessary or difficult to measure, they can be abandoned properly to ensure the integrity of the overall scientific research performance evaluation system.

3.4 Principle of independence and brevity

The evaluation index system of scientific research performance is composed of one index, which is not piled up at will, each index has its own function, which can not be replaced by other indicators, the meaning of indicators cannot be overlapped. Be independent. In addition, the selection of indicators should be as concise as possible, concise indicators can reduce the time and cost of evaluation, to ensure the optimization of the index system.

3.5 Combination of quantitative and qualitative principles

The quantitative index is the important part of the index system. However, as far as the present research situation is concerned, because many data are difficult to quantify, it is very difficult to carry out the complete quantitative research, so we should consider the qualitative index when setting up the index. Make the combination of quantitative index and qualitative index.

3.6 Operational principles

Operational principles can also be understood as feasibility principles. Evaluation of scientific research performance is a very practical work, not only in the setting of indicators to consider

whether the relevant data can be collected, but also the specific content of the indicators, methods should consider the practical operability.

4. Selection of Indicators for Evaluation of Scientific Research Performance and Construction of Index System

Table 1 Research Performance Evaluation System of Research Universities

Primary indicator	Secondary index	Tertiary index
scientific research input	human resources	academician
		Thousand Talents program
		Special Professor of the Yangtze River Scholars
		Winner of the National Science Foundation for Outstanding Youth
		Professor of the Yangtze River Scholars
		Outstanding talents in the New Century
	Research platform	National key disciplines
		National key Laboratory (Centre)
		Ministry of Education key Laboratory (Center, Base)
		National Natural Science Foundation Innovation Research Group
		Ministry of Education Innovation team
		Provincial key scientific research platform (provincial key laboratory, provincial engineering technology research center)
		Number of National Natural Science Foundation projects
	project	Number of National Natural Science Foundation projects
		Number of National Social Science Foundation projects
		Number of Social Science Foundation projects of the Ministry of Education
		937863 items
win a prize	thesis	Outstanding article
		International influence papers
	patent	Patent applications and authorizations
	win a prize	State awards
		On 100 excellent PhDs in China
		Ten Scientific and technological advances in China (Ministry of Science and Technology)
		Progress of the Ten Social Sciences in Chinese Universities (Ministry of Education)
	community service	Degree of conformity between Master's degree of First-Class discipline and Local Pillar Industry
		Decision inquiry report
		Horizontal subject number

Based on the basic principles of the design of the evaluation system of university scientific research performance, the author refers to some relevant research results at home and abroad,^{[2][3]}^[4] in the selection of indicators, on the one hand, referring to the relevant research abroad, According to the actual situation of our country, some indexes are eliminated and some indexes are retained. On the other hand, referring to the related research on the research performance index system of research universities and the research index system of local universities, some common indexes are retained and some local characteristics are added. After consulting the relevant experts and according to the particularity of the object of study, a research university course was developed. Research the index system of performance evaluation, which is the basis for the establishment of the research index system.

The system consists of 2 first-level indicators, 7 second-level indicators and 26 third-level indicators. Three points need to be explained here: first, the choice of research performance evaluation index of research universities is mainly to consider the efficiency of scientific research input-output, with emphasis on scientific research output. In addition, in the scientific research investment, mainly examines the human resources, the scientific research platform and the scientific research project, the scientific research funds will not be the key inspection object, mainly because: first, the source of the scientific research funds is unknown. Research funds generally come from national governments, local governments, social groups and individuals, but social groups and individuals spend on this part of the data is difficult to collect and integrate ; Secondly, research universities belong to local governments and play a leading role. Because different local governments have different inputs, the comparability among research universities is very low. Therefore, we do not include scientific research funds in the index system here. This is also different from the general scientific research performance evaluation index system^[5]. Second, in the selection of research performance evaluation indexes of research universities, we should consider local specific indicators and highlight local characteristics, such as the provincial key scientific research platform, the degree of conformity between the master's degree of first-level disciplines and the local pillar industries. Number of decision consulting reports and horizontal topics. However, each research university has its own unique local indicators, it is difficult to unify. Moreover, the collection of data is not complete in practice, which is where the index system needs to be improved. Third, in order to make the evaluation more scientific, we should consider the combination of qualitative index and quantitative index when we set up the index. However, the qualitative index is generally expressed in the reputation of the school and is difficult to quantify, so this index system is not included in the index system. Combined with the above three considerations, we design a research university research performance evaluation index system, as shown in the following table (Table 1).

In this study, the indexes of research performance evaluation of research universities can be attributed to two primary indexes: the input of scientific research and the output of scientific research, the establishment of multi-level secondary indexes under the first-class indexes, and the establishment of multi-level and third-grade indexes under the second-class indexes. Next, this study will explain the specific indicators.

4.1 Research input indicators

Scientific research investment refers to the sum of all elements invested to satisfy the smooth progress of scientific research. The first-level index scientific research input mainly includes the human resources, the scientific research platform and the scientific research project input.

1) Human resources

One of the three functions of universities is the cultivation of talents. It can be seen that the importance of talents to universities is that only by importing high-quality talents can more high-level talents be exported. Here, we will be academicians, thousands of people plan, the Yangtze River scholar special professor, the national outstanding youth science foundation winner, the Yangtze River scholar chair professor, the new century outstanding talented person six three level indexes into the human resources target.

Academicians, namely both academicians, academicians of the Chinese Academy of Sciences and academicians of the Academy of Engineering.

In order to realize the strategic goal of national development, to introduce a group of industry leaders in order to realize the strategic goal of national development, to bring in a group of industry leaders, such as national key innovation projects and key subject laboratories, is referred to as the "Thousand-Talent Plan".

Both special professors of the Yangtze River Scholars and chairs of the Yangtze Scholars are part of the "Yangtze River Scholars Award Scheme", which aims to foster leading academic leaders in the world. In order to improve the ability of our universities in the national innovation system and the academic status in the international.

The winner of the National Outstanding Youth Science Fund mainly refers to the outstanding young scholars selected by our country to encourage overseas scholars to return to China for scientific research (mainly basic research).

The outstanding talents of the new century come from the "New Century talents support Program" of the Ministry of Education, which is a special talent support program established by the Ministry of Education, mainly by the "Young Teachers Award in Colleges and Universities" and the "Trans-Century Talent". There are four parts of the excellent Young Teachers Assistance Scheme and the Young backbone teacher Program of Colleges and Universities.

2) Research platform

Scientific research platform is the material guarantee of scientific research, which can reflect the ability of cultivating talents and the ability of scientific research creation on the platform. Whether basic research or applied research, good scientific research platform often reflects the strength of scientific research. The secondary indicators of the scientific research platform mainly include the national key disciplines, the State key Laboratory (Center), the Ministry of Education key Laboratory (Center, Base), and the National Natural Science Foundation Innovation Research Group. Ministry of Education innovation team and provincial key scientific research platform^[6].

The national key disciplines mainly include the first, the second, the national key subjects, the national key disciplines, in which the national key disciplines are also the national key disciplines. The number of key subjects directly determines the status of the university in China.

The State key Laboratory (Center) and the key Laboratory (Center, Base) of the Ministry of Education are the gathering sites for high-level talents, and are also important bases for high-level academic exchanges and basic and applied research. It is an important part of the national innovation system.

The innovative research group of the National Natural Science Foundation of China (NSFC) is an innovative talent and group cultivated by the National Natural Science Foundation Committee in order to better support basic research and applied research.

The innovation team of the Ministry of Education is a team led by academicians of both houses and specially appointed professors of Yangtze River scholars, relying on the national key scientific research bases and key laboratories, aiming at promoting the construction of world-class universities and improving their innovative ability.

Provincial key scientific research platform includes provincial key laboratory (center, base) and provincial engineering technology research center. Among them, provincial key laboratories (centers and bases) are important places and platforms for providing the society with scientific research achievements and standard testing tests based on different scientific research tasks and requirements, relying on institutions such as school leavers, scientific research institutes and enterprises, etc. It is an important part of provincial science and technology innovation system. The provincial engineering technology research center is a platform for engineering research and development. The research of engineering technology is carried out to promote the transformation of achievements in order to promote the upgrading of technology level and the progress of science and technology in related industries. This study selects the provincial key scientific research platform index to highlight the research university The link between scientific research and local social development.

3) Research projects

The secondary index of the scientific research project mainly includes four three indexes: the number of projects of the National Natural Science Foundation, the number of projects of the National Social Science Foundation, the number of projects of the Ministry of Education Social Science Foundation and the number of 973863 projects. In this index, the National and Ministry of Education Natural Science Foundation projects and Social Science Foundation projects are mainly inspected, key projects and facade projects three parts, 973863 projects in the unit where the Chief Scientist is based.

The projects of the National Natural Science Foundation and the State Social Science Foundation are the main means and ways to support the development of scientific research in China. They

mainly support the scientific research personnel engaged in basic research and applied research in universities and scientific research institutions. Among them, the National Natural Science Foundation includes four parts: natural science foundation, facade project, key project and talent project. There are six major projects in the National Social Science Foundation: major projects, annual projects, special entrustment projects, post-funded projects, western projects and Chinese academic translation projects.

Project 973,863 comes from the 973 Program, the 863 Project. Among them, the 973 Plan (also known as the National key basic Research and Development Plan) aims to solve the major scientific problems in the national strategic needs; The "863 Program" is a national high-tech research and development program, which aims to promote the improvement of China's independent innovation ability, and attaches great importance to the development of cutting-edge technology research and development, and adheres to strategic, forward and forward-looking research and development.

4.2 Research output indicators

Scientific research output refers to various forms of scientific research results formed by scientific research personnel using scientific research resources. The first-level index scientific research output mainly includes the thesis, the patent, the award and the social service.

1) Papers

The paper is an important index to evaluate the scientific research output. The level of the paper can reflect the level and quality of the paper. In the index system of this study, the thesis mainly includes two articles: outstanding paper and international influence paper.

Excellent papers mainly include the number of papers included in SCI,SSCI,A&HCI. SCI (Science Citation Index and SSCI (Social Science Citation Index), which is a citation database established by the American Institute of Scientific Information. Is an authoritative international retrieval tool. MHCI (art and humanities citation index) is contains art archaeology philosophy and other arts and humanities field of art and humanities more authoritative citation database.

International influence papers mainly include Science papers, Nature papers and ESI top papers. Science and Nature in the United States are the best original research papers, reviews and peer-reviewed journals on existing research and science policy analysis. The United States ESI is a basic scientific index, which is divided into 22 subjects, such as agriculture, biology and so on. It is an evaluation tool for researching scientific research performance and tracking the development of scientific research.

2) patents

Patent is not only an important index to show the quality of scientific research activities, but also an important index to weigh the creativity of scientific research and the competitiveness of scientific research in a university. Because the evaluation object of this index system is the research performance of the research university, it pays more attention to the creativity of scientific research. Therefore, the second level index patent focuses on the number of patent applications and licenses.

3) Prize-winning

The number of awards not only reflects the strength of scientific research in colleges and universities, but also stimulates the innovative spirit of researchers and further promotes the development of scientific research in colleges and universities. The award of the second grade index mainly includes the national award, the national 100 outstanding doctoral thesis, the ten scientific and technological progress of China (Ministry of Science and Technology) and the ten scientific and technological progress of Chinese universities (Ministry of Education).

The state awards mainly include the National Science and Technology Award and the Ministry of Education Humanities and Social Sciences Award, the National Statistics highest Award, the Principal Award, the first Class, the second and the third Class Award.

National 100 excellent doctoral thesis, statistics will win the thesis and the nomination thesis included together.

China's top ten scientific and technological progress (Ministry of Science and Technology) is sponsored by the Chinese Academy of Sciences and the Chinese Academy of Engineering.

The top ten scientific and technological progress of Chinese universities (Ministry of Education) is from 1998 to present, in order to promote the development of scientific research in commercial schools, the top ten scientific and technological progress of Chinese commercial schools are selected by the Ministry of Education.

4) Social services

The research service of research universities to local society mainly refers to the value created by research universities as a kind of social existence, for local social economy, culture, science and technology and so on. Here, we bring the degree of conformity between the master's degree and the local pillar industry, the report of decision consultation, and the number of horizontal subjects into the social service index.

The degree of conformity between the first-degree discipline master degree and the local pillar industry mainly refers to the ratio between the number of disciplines corresponding to the local pillar industry and the total number of first-level master degree points in the first-level discipline master's degree in colleges and universities. This index can well reflect the service of scientific research in research universities to the local economy.

The decision consultation report mainly refers to the relatively neutral and objective special position of the university in the decision-making consultation, which provides some valuable consultation reports to the government at all levels, enterprises and institutions, and plays a special role in the decision-making consultation.

Horizontal topics are those entrusted to governments at all levels and their functional departments, enterprises and institutions, social organizations, etc., as opposed to vertical ones (which have been identified as national, provincial, and ministerial, except for those at the school level), Including scientific research, technical research, decision-making, planning, design demonstration software development and so on. It is an important way for schools to expand their foreign trade relations, serve local economic construction, and improve their research level and popularity. In this study, the horizontal subject number is chosen to highlight the degree of scientific research in research universities serving the local economic construction.

5. Conclusion

This study discusses the relevant theories involved in the evaluation of research performance in research universities, and puts forward six basic principles that should be followed in the evaluation of research performance in research universities. And on the basis of these evaluation principles, according to the actual situation of scientific research in research universities, the related indexes of scientific research are screened, and finally two first-grade indexes are formed. The evaluation index system of scientific research of 7 secondary and 26 tertiary indexes is established, and each dimension and index are elaborated in detail. It is hoped that, through this study, the Researchers in relevant fields and university workers provide research basis and practical reference, and effectively improve scientific research management through performance evaluation.

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