

UK Science Research Management Mode, Development Status and Experience References

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Abstract—In the field of science research and innovation, UK has always maintained world-class development level. UK government attaches great importance to science research management system development, including science research investment funds, science researchers educational funds and academic exchanges. The government aims to strengthen and maintain industrial advantage in the field of competitive technology in the UK. This paper summarizes UK public science research management mode, and take UK Research Councils (RCUK), Higher Education Funding Council (HEFCs) and other foundation organizations as examples to analysis institution and project funding system. Furthermore, it puts forward some suggestions for advancing management of research and development, improving research assessment exercise and promoting public research institutions reformation.

Keywords—UK; Science Research; Management mode; Education funding; Experience

I. UK PUBLIC SCIENCE RESEARCH INSTITUTIONS "DUAL SUPPORT SYSTEM"

UK government's public science research foundation system is called "Dual Support System" (Figure1), Department for Business, Energy & Industrial Strategy (BEIS), is a government department, created as a result of a merger between the Department of Energy and Climate Change (DECC) and Department for Business, Innovation and Skills (BIS). It is integrated commerce, industrial strategy, science, innovation, energy and climate change fields science and technology development, and its main function includes formulating science and technology innovation industrial policy, promoting research innovation-driven development and international innovation cooperation. BEIS does not directly manage research funding allocation, but it supports research activities of universities and research institutions research activities through the UK Research Council (RCUK) and the Higher Education Fund Councils (HEFCs) [1].

II. RESEARCH FIELD DISTRIBUTION AND FINANCING FORMATION OF FOUNDATIONS

A. UK Research Council (RCUK)

RCUK is a non-departmental public body which is founded in 2002 to coordinates science policy in the United Kingdom. It is an umbrella organization, which is responsible for funding and coordinating academic and basic research for seven independent research councils. Furthermore, it is responsible for scientific research work of universities and public research institutions scientific research work through government foundation. The seven research councils have launched a large number of basic research programs in their institutes and laboratories. The main financing forms are based on specific projects and programs, and funding investment must have detailed assignment proposal.

The 7 research councils in specific technology research field distribution are as follows:

- Arts and Humanities Research Council (AHRC): Supporting interdisciplinary research in fields of modern language and linguistics, visual arts and media, information and museum research;
- Biotechnology and Biological Sciences Research Council (BBSRC): Supporting the field of biological science, including genomics, aging population, biodiversity and renewable manufacturing based on new organisms;
- Engineering and Physical Sciences Research Council (EPSRC): Supporting basic research of physical science through engineering technology applications;
- Economic and Social Research Council (ESRC): Supporting interdisciplinary research in field of social science and economic research;
- Medical Research Council (MRC): Supporting all aspects of medical research from molecular research to clinical practice;
- Natural Environment Research Council (NERC): Supporting environmental research, measurement and observation in a wide range of interdisciplinary fields;

- Science and Technology Facilities Council (STFC): Supporting research fields of astronomy, computational science, nuclear physics, high-energy physics and space science.

B. Higher Education Fund Council (HEFCs)

HEFCE strategic objectives are building and maintaining a dynamic international competitiveness research department to promote economic prosperity and national stability. In order to maintain British research foundation in response to global competition, HEFCE has constantly look for and supported excellent research excellent research, and cultivated effective cooperation.

HEFCE aims to provide research institutions ability: entrustment research tasks by other funding sources; adaptability in emerging fields; equipment training new researchers; basic research undertaking ability.

1) Funding purposes

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2) Funds limitation and classification

HEFCE foundation types are divided into two categories: "Quality- related funding", foundation amount is £13.91bn; "Research capability funding", foundation amount is £2200 million. Most financing fields are distributed in 4 aspects: education, science research, academic exchange and asset investment.

According to HEFCE web site published data, 2013 to 2017, with the maturity of infrastructure assets investment, science research education and infrastructure assets investment are gradually decreasing every year. Technology research financial support in has increased year by year. The HEFCE fund various universities and colleges, and the largest amount of funding is education.

HEFCE and integrates various factors to provide financial support, which includes types of students in higher education institutions, disciplines of universities, infrastructure construction and library construction, and finally implements appropriation programs.

Science research budgets in 2010-2015 fiscal years, UK Research Council (RCUK) and Higher Education Funding Council for England (HEFCE) were provided as shown in Table 1. The data indicate RCUK and HEFCE two agencies have received 92% of total amount of science research budgets; they can fully increase financial support for public research institutions [2].

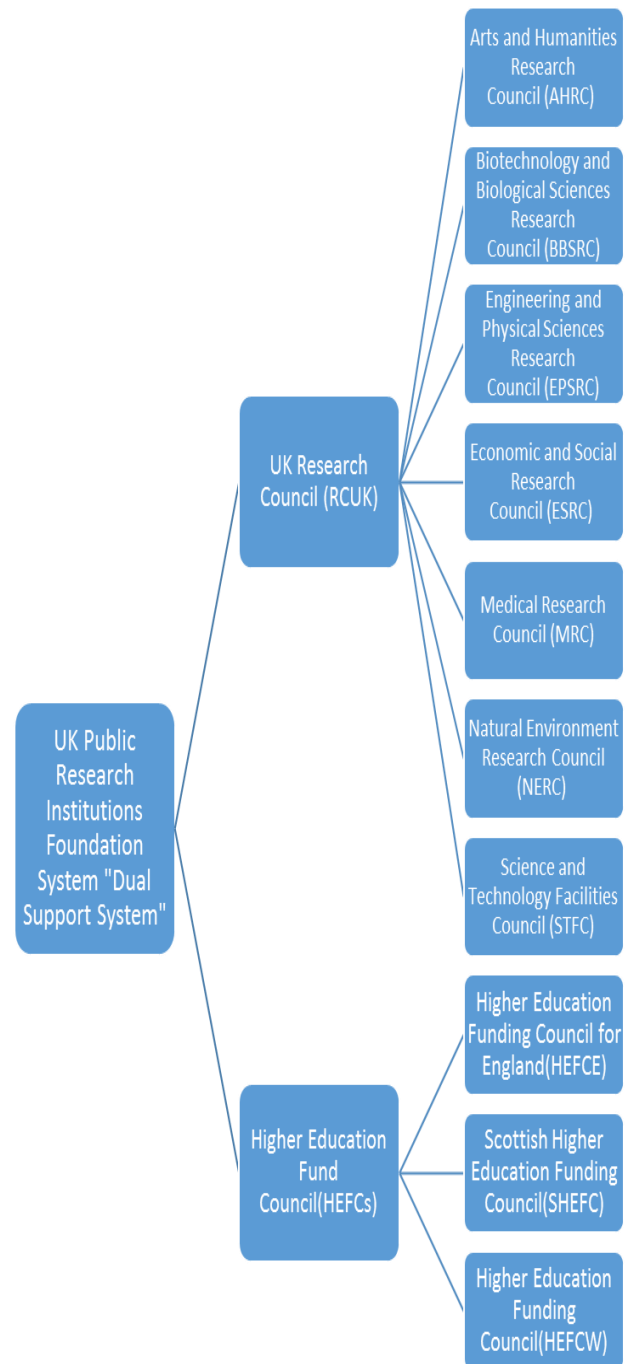


Fig. 1. UK Public Research Institutions Foundation System--"Dual Support System"

TABLE I. 2010-2015 FISCAL YEARS RCUK AND HEFCE FUNDING ALLOCATIONS (UNIT: £000) ^[3]

Fiscal years	UK Research Council (RCUK)	Higher Education Funding Council for England (HEFCE)	Science & Research Total
2010-2011	2,549,353	1,731,300	4,575,906
2011-2012	2,596,196	1,662,112	4,575,906
2012-2013	2,573,678	1,699,578	4,575,906
2013-2014	2,586,641	1,685,689	4,575,906
2014-2015	2,599,812	1,686,321	4,575,906

C. Funding organizations

1) Public Sector Research Exploitation Fund (PSRE)

Public Sector Research Exploitation Fund (PSRE) has two types of funding within the scope of research institutions: one is the "Capability Building Component", the next step of knowledge transfer and commercialization strategy is necessary to purchase indispensable infrastructure for supporting commercial and project development. The other one is "Seed Fund Component", purpose of Seed Fund establishment is to help better research results to be successfully converted into commercial projects.

2) Wellcome Trust Foundation

The Wellcome Trust foundation was first established in 1936, is the founder of American born in British pharmaceutical giant, Henry Wellcome sir. Wellcome Trust foundation is one of the largest charity organizations, biopharmaceutical sponsor and biomedical research foundation to cultivating and promoting human and animal health welfare. The foundation financial source is from private donations, and it is operating management in the way of long-term stability and annual increment.

The Wellcome Trust focuses attention on biomedical field and a serious problem of public health. The annual donation is about £14.5bn. 2010-2020 research sponsorship strategy is genetics and genome research to maximize relevant benefit. Specific fields related to research on human brain, major infectious diseases, aging and chronic diseases, environment, nutrition and health.

D. Research Assessment Exercise (RAE) to Research Excellence Framework (REF)

Research Assessment Exercise (RAE) was an exercise undertaken approximately every 5 years on behalf of the four UK higher education funding councils (HEFCE, SHEFC, HEFCW, DELNI) to evaluate the quality of research undertaken by British higher education institutions. RAE evaluates various universities to enhance their contribution to economy and society. By assessment, colleges and universities contribution value has been quantified by numeric value form, and the amount of appropriation needed for the next five year plan is made accordingly [4].

In 2001, RAE carried out 5 assessments. With the continuous advancement of research evaluation, UK domestic scholars began to pay attention to explore problems in RAE evaluation system. In 2006, UK government decided to start a

new evaluation system in 2008, the Research Excellence Framework (REF). This system establishes experimental plan of bibliometrical method, HEFCE has implemented science research assessment pilot test. The research is mainly focused on subjects, evaluation groups, feedback collection and experimental result interpretation. Finally, there were selected five subjects as a pilot subject: clinical medicine, physics, earth system and environmental science, social work and social policy, English language and literature. Furthermore, there were chosen 29 institutions of higher education as pilot subjects, and relevant evaluation materials such as case study and case elaboration were required [5].

III. EXPERIENCE OF UK PUBLIC RESEARCH INSTITUTIONS FUNDING MODEL

A. Science research budget provides a reliable funding source for public research institutions

Public research institutions have undertaken a national basic, strategic and public interest research activities. This characteristic determines that it cannot mainly depend on market to provide research support. For a long time, UK government is a major investor for public research institutions. UK government has fully increased its investment in science and research. UK government provides a reliable funding source for public research institutions through science and research budgets. Thereinto, a large proportion of funds were obtained by RCUK, and RCUK was main sponsor of public research institution [6].

B. Establishing science research evaluation system for public research institutions

In Britain's dual funding system, the higher education foundation has allocated funds to them based on the evaluation results of university studies, which are institutional funding. In UK dual funding system, HEFCs based on university research the evaluation results to allocate foundation, it is called institutional funding mode. For example, 7 research institutes subordinate Biotechnology and Biological Sciences Research Council (BBSRC) provided "Core Strategic Grant (CSG)". CSG is based on "Institute Assessment Exercise (IAE)" to support institutes with a cycle of four years. This institutional support provides sufficient operating costs for the BBSRC Institute.

C. Improving institutional financing efficiency through performance assessment

Institutional funding mode is propitious to maintaining sustainable development of public research institutions, and it is conducive to research capacity improvement and the research results accumulation. Institutional funding is a necessary funding model for public research institutions, especially those engaged in basic and strategic research. From experiences in UK, it is more effective method to use performance evaluation for public research institutions through "Institute Assessment Exercise (IAE)" and "Research Excellence Frame (REF)".

D. Promoting public research institutions reformation to ensure funding degree

UK public research institutions have also experienced plight of insufficient funds and low efficiency. Since 1970s, UK has carried out three stages reformation for public research institutions. Especially in the privatization reform in 1990s, UK government has broken through the restriction of property rights, tried various modes of ownership, and reduced quantity of public research institutions. It has provided reliable support for optimizing financing model of public research institutions and has achieved fine effects [7].

IV. CONCLUSION

We suggest government should increase total amount of public research institutions funding, and UK experiences are used for references to promoting public research institutions innovation in China, trying multiple ownership patterns, reducing the number of public research institutions, ensuring each research institution funding intensity. Public research institutions are designed to improve better efficiency, and this process needs to consider into two factors: one is public research institute mission; the other one is necessary to consider division between universities, enterprises and research institutions. Establishing public research institutions, government can provide project support to universities, enterprises and research institutions.

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