ISSN 2616-5783 Vol.5, Issue 11: 55-59, DOI: 10.25236/AJHSS.2022.051112

Road of Building a Science and Technology Power in Britain and Its Contemporary Enlightenment

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Abstract: *The UK is a country with a long history and a rich scientific tradition, the historical experience of the rapid development of science and technology in Britain shows that scientific and technological innovation is an important cornerstone, scientific and technological talents are important resource, and scientific and technological culture is an important driving force to build a powerful country in science and technology. At present, China has issued to build a world-class scientific and technological power. If we want to compete courageously in building a world-class scientific and technological power, we must always put innovation at the core of our national development strategy, always attach importance to the important position of scientific and technological talents in scientific and technological creation, always attach importance to the leading role of scientific and technological culture in scientific and technological development, and form a joint force to promote the stability and far-reaching development of science and technology.*

Keywords: *United Kingdom, Science and Technology Power, science and technology innovation*

1. Introduction

The UK is a country with a long history and a rich scientific tradition. Britain's development history of science and technology is also a history of the rise of great power through technological revolution, industrial revolution and modernization. Britain's road to become a powerful country in science and technology has important enlightenment. To deeply understand its contemporary value, we must have a basic understanding of the development of science and technology in Britain, that is to clarify the historical context of the development of science and technology in Britain, and to understand the measures and efforts taken by Britain to maintain its leading position in the field of science and technology.

2. A brief review of the development of science and technology in the UK

Since modern times, from the 17th century to the middle of the 19th century, it was a period of rapid development of the UK science and technology. The overthrow of the feudal autocratic system fundamentally cleared the obstacles for the development of capitalism, and established a unified domestic market, which laid the foundation for the development of the market economy. England has emerged the pioneers of modern science such as Bacon, Newton, Boyle, Hooke, etc. and made a foundational contribution for the establishment of the modern scientific theoretical system, it can be said that "the cultural soil of England in the 17th century was particularly fertile for the growth and dissemination of science[1]".The tradition of British craftsmen brought together the development of science and technology. A large number of engineers and skilled workers with high-level skills and high-level scientific and technological knowledge, good social and political conditions, material conditions, cultural soil, and human capital are already available. With the emergence of the "Jenny Spinning Machine" in 1765, the industrial revolution started firstly in the here. During this period, the scientific and technological achievements of the UK were highly concentrated, and the scientific and technological status was in a leading position in the world. From the middle of 19th century to the beginning of 20th century, the development of British science and technology was in a downturn. Britain missed the opportunity in the second scientific and technological revolution marked by the invention and wide application of electricity, and lost its leading position in science and technology, Germany and the United States which seized the opportunity of the second scientific and technological revolution have greatly improved their manufacturing capabilities, "gross output surpassed that of the United Kingdom in the 1890s and the first decade of the 20th century[2] ", and the world's science center began to shift to other

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countries as well. It was worth mentioning that the two World Wars have made the British government realized the importance of supporting science and technology, and began to actively invest in science and technology and education. Especially during the World War II, the investment in research and development increased rapidly. From the second half of the 20th century has been a period of rapid development of British in science and technology. Britain actively seized the opportunity of the third scientific and technological revolution represented by information technology, followed the trend, took advantage of the trend, focused on the development of atomic energy, aerospace, military technology and other fields, and achieved some considerable achievements. After the late 20th century, the British government began to vigorously cultivate a national innovation system, striving to maintain the UK's dominant position in the world's scientific and technological innovation field.

3. Key measures on the road to be a scientific and technological power in the UK

Britain actively carried out the "Technology Foresight Programs", built and improved the national innovation system, developed higher science and technology education, attached importance to the construction of scientific and technological talents and legal system, and adopted a series of important measures to help the development of science and technology.

3.1 Carrying out the "Technology Foresight Programs"

Technology foresight refers to "the systematic exploration of the long-term future of science, technology, economy, and society, which is aim at identifying strategic research areas and emerging general technologies that are likely to yield the greatest economic and social benefits[3]". Based on the interpretation, that technology foresight programs are important basis to formulae science and technology policies and determine priority areas of support. Since the 1990s, the UK has carried out three rounds of technology foresight programs. In 1993, with the release of the white paper "Realizing Our Potential: A Strategy for Science, Engineering and Technology", "Technology Foresight Programs" have already started. From 1994 to 1999 was the first stage, which adopted the method of technology foresight in different fields, established expert groups in 15 fields, and put forward 27 technologies for priority development; 1999-2001 was the second stage, which adopted the method of thematic technology foresight, expert groups is adjusted from the 15 to 3, added 3 thematic groups (population aging, crime prevention, manufacturing 2020) 2 supporting themes (education, skills and training, sustainable development); 2002 is the third stage of the programs, this stage adopted the method of rolling technology foresight, that is each foresight plan contains 3-4 projects, the research period is about 2 years. It is worth emphasizing that the research time of 2 years does not mean project will be stopped when the time is up, according to the actual situation to determine whether to roll or continue. Some projects are running continuously.

3.2 Building and improving the national innovation system

Driven by the wave of knowledge economy, the demand for scientific and technological innovation has become increasingly prominent. It is proposed to build a national innovation system with the development of knowledge economy as the core and release many white papers about innovating including "Our competitive future: Building the knowledge-driven economy" "Excellence and Opportunity—Science and Innovation for the 21st Century" "Opportunity in a Changing World—Entrepreneurship, Skills and Innovation" "Competing in a Global Economy: Innovation Challenge" "Innovation Nation" "Our Growth Plan: Science and Innovation" etc., and formulated corresponding innovation policy and plans to guide the direction of innovation and development in the new century and even in the future. Among them, the white paper "Innovative Nation" released in 2008 proposed to build an innovative country that driven the prosperity of the whole society through innovation, which intuitively reflects the importance of innovation in national development, not just for the field of science and technology. The "UK Research and Development Roadmap" released in 2020 is a comprehensive guideline for the UK to promote the implementation of a scientific and technological power, and draws a grand blueprint for UK research and innovation in the future. In addition, in the process of building an innovative country and a national innovation system, comprehensive national science centers have become basic platforms and important positions, such as the Harwell Science and Innovation Campus and Das Sci-Tech Daresbury, etc.

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3.3 Developing the higher science and technology education

Britain's higher education can be described as world-renowned. The development of higher education is accompanied by the development of higher science and technology education. Naturally, higher science and technology education in the UK is also well-known far and wide. Before the 19th century in the UK, a group of pioneers of modern science have emerged such as Newton and Boyle, science had made great progress, but the development of science education was still relatively slow, science was included in the education curriculum until the 19th century. With the deepening of the industrial revolution, the importance of science was recognized by more people. British government and all sectors of society began to attach importance to the investment for higher science and technology education. On the one hand, building science and technology colleges. In 1828, University College London was established. After that, there are many universities emerged in different cities, including the colleges of higher science and technology education. On the other hand, reforming the ancient universities such as University of Oxford and University of Cambridge. "In 1890-1891, 191 of the 457 courses arranged by University of Oxford, University of Cambridge and University College London were about natural sciences[4]".In addition, the British government also actively promoted the institutionalization of science and technology education. In 1853, the Bureau of Science and Art was established, the "Education Act,1870" was promulgated. In 1887, the National Technical Education Promotion Association was established, promulgated "Technical Education Act of 1888" and the "1891 Amendment", it can be said that the 19th century was the century of the formation of higher science and technology education in the United Kingdom.

3.4 Attaching importance to technology talents and the construction of scientific and technological legal system

The first is to attach great importance to talent training, introduction, and motivation. Human resources have always been an important strategic resource in the competition of synthetic national power, even the first resource, so we must seize the breakthrough of talent. In terms of talent training, universities are the cradle of talent cultivation and the resort of scientific research, so we should make full use of the main position for talent cultivation; in terms of talent introduction, the British government has released the Outstanding Talent Program, which is organized and executed by the migration agency[5]. In February 2020, the British government officially launched the "Global Talent Visa" to recruit global technology elites; in terms of talent motivation, the British government supports the Wolfson Foundation and the Royal Society to set up the "Top Talent Scholarship Program" to fund outstanding scientists. What's more, the British government has also formulated and established corresponding funding and incentive programs for graduate students or researchers in the early stages of their careers. The second, it attaches great importance to the construction and improvement of the legal system of science and technology. The legal system of science and technology is an important link to protect the fruits of innovators' labor. The UK is the first country to implement the patent system in the world. In 1624, the "Monopoly Law" was enacted. In 1852, the Patent Law Amendment Decree was introduced and set up the States Patent Office (renamed the Intellectual Property Office in 2007). Since 2011, with the reforming plan of the intellectual property law plan, the "UK International Intellectual Property Strategy" and "The Prevention and Countermeasures: The UK's 2011 Strategy for Addressing Intellectual Property Crime" have been formulated. In 2014, the new UK Intellectual Property Act was amended and implemented. This series of measures has greatly stimulated people's enthusiasm for innovation, created a good and free innovation environment. To a certain extent, it is more conducive for the transformation of scientific and technological achievements and produces greater social benefits.

4. The Contemporary Enlightenment of the UK as a World Power in Science and Technology

The status and achievements of science and technology are not obtained easily, but are obtained by grasping the opportunities of scientific and technological revolution, gasping the pulse of the times, and gradually accumulated in the long historical years. In terms of the development of science and technology in my country, there are the following experiences and enlightenments.

4.1 Scientific and technological innovation is an important cornerstone leading to a powerful **country** *in science and technology*

Throughout the history of human social development, it is not difficult to find that the scientific and

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technological revolutions have triggered a series of industry transformation, led to the rise and fall of great powers and the adjustment of the world structure. Innovating has always been an important force for the development of a country and a nation, as well as an important force for the progress of human society.

Nowadays, China has sounded the horn of building a world power and issued a great call to strive hard for building a world power in science and technology, taken the path of independent innovation with Chinese characteristics unswervingly, implement the innovation driven development strategy, enter the forefront of innovative countries, and achieve High-level scientific and technological self-reliance. To promote scientific and technological innovation, we must establish an institutional environment conducive to innovation, and use the system to fully mobilize the enthusiasm and initiative of innovation; strengthen basic research and increase research investment. Basic research is the source of scientific and technological innovation, and strengthening basic research is also an important way to improve scientific and technological innovation capabilities. Increasing research investment is the key to strengthening basic research.

4.2 Scientific and technological talents are important resource leading to a powerful country in science *and technology*

The main body of scientific and technological innovation and creation is scientific and technological talents, they are important support and important human capital for building a scientific and technological power. Looking back at the development history of the UK, the UK is a country with a tradition of respecting engineers and craftsmen. In 2021, the UK released the "R&D Personnel and Culture Strategy", placing the attraction, training and retention of a large number of talents at a strategic height.

China has always attached great importance to the talents in scientific and technological undertakings, emphasized repeatedly that talents are the most critical factor in scientific and technological innovation, and the essence of innovation-driven is talent-driven. Respecting talents is also a long-standing tradition of the Chinese nation. To gather outstanding talents for innovative causes, on the one hand, we must continue to pay attention to the talents' training, introduction and use, improve the talent training model, reform the mechanism of talent introduction and use, especially for the young people. The cultivation of scientific and technological talents and innovative talents leads young talents and young innovative talents to strive for the first place on the track of building a world science and technology power. On the other hand, we must pay attention to the growth of talents and the working and living environment, respect the law of talents' growth, and create a good working and living environment to conduct scientific and technological innovation for them.

4.3 Scientific and technological culture is an important driving force leading to a powerful country in *science and technology*

The development of a country and a nation requires not only huge material strength, but also strong spiritual strength, and the same is true for scientific and technological undertakings. The UK has a long scientific tradition and a free academic environment. "The free tradition of UK makes British science in a cultural atmosphere suitable for the long-term and stable development [6]. "

The healthy and orderly development of science and technology depends on the cultural atmosphere of sustainable development. Putting it in a specific development situation is to take root in the profound cultural fertile soil of China, and establish a science and technology culture system that is linked to the specific reality of China's. The history of my country's scientific and technological development is also a history of technological and cultural construction. To build a world power of science and technology requires not only the support of science and technology, but also the guidance of scientific and technological culture. On the one hand, we must continue to promote the improvement of science and technology policies and systems, and give them new content with the development of the times; on the other hand, science popularization and technological innovation are like two wings of scientific and technological development, we should do a good job of science popularization and form a strong atmosphere of respect for knowledge, innovation, talent, love for science, and dedication to science in the whole society.

5. Conclusions

The experience of the development of science and technology in the UK tells us that the rise of great

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powers and the take-off of science and technology are not accidental, nor do they happen overnight. Innovation, talents, culture, etc. are all indispensable links in the technological development chain, and none of them can be missing. We must always attach great importance to the position of technological innovation, technological talents, and technological culture, so as to form a positive interaction and promote healthy development, to bring together the majestic force for building a world power in science and technology.

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