Research on the Scientific and Technological Innovation of Research University and Its Strategic Measures

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Abstract: This paper illustrates the important role that the scientific and technological innovation plays in the research university. Technological innovation is one of the main functions that the research university serves and contributes for the development of economy and society, which is the essential measure for Research University to promote construction of disciplines and enhance academic strength and economic power. The thesis analyses in detail how to take and strengthen technological innovation for Research University.

Key words: research university technological innovation strategic measures

Research University is not only the base of knowledge innovation, production, spread and appliance but also the base of scientific research and cultivation of high-level talents. It has advantages in talents, infrastructure and atmosphere to take technological innovation, which will become clearer day by day along with enhancing strategic status of higher education. After the nation has carried out the strategy of "prospering the nation with science and education", the base condition, researching achievement, industrialization of achievements of research university have made remarkable changes. Research University has become the main power of technological innovation in China. However, as there are still some factors that hamper technological innovation of university and college in the science, technology and education system, and the potential ability of technological innovation has not been completely stimulated, which is not adapted to the current situation of national technological innovation. Recently, "some opinions about making full use of the university and college's technological innovation effects" was released by the department of Science and Technology and Department of Education. It will influence technological innovation of Research University deeply, and promote the technological innovation project greatly.

1. The Status of Technological Innovation in Research University

1.1 Technological Innovation is One of the Main Functions that Research University Serves and Makes Contribution for the Development of Economics and Society

The research university should hold on the principle of "serving to gain support, making contribution to develop", and contribute in the way of cultivating talents and intelligence support to the development of

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economics and society. The technological innovation, including research of science, is one of the most important functions of Research University. The research university should make great efforts to be the main force of national fundamental research, the appliance research and high-technology industrialization. The research university's scientific and technological industry should become the important power to promote the development of local economy, while the high-technology industrial garden of Research University should become the incubator and powerhouse of local high-technology. All these require that the research university should regard the technological innovation as the main task.

1.2 Technological Innovation is the Fundamental Measure for Research University to Promote Discipline Development and Strengthen Science Strength

The discipline development is an important facet of university development, and the university should take it as the main line of construction. In fact, discipline development and technological innovation cannot be divided. It is impossible to improve the discipline level without technological innovation. The main symbols of so-called high-class discipline are: the first-level science team, the first-level achievement of research and industrialization, the first-level ability of technological innovation.

Real ability is the basic factor of Research University. The embodiments of real ability are academic strength, economic power and cohesiveness of people. The academic strength and economic power are to some degree decided by the level of science research and technology industrialization.

1.3 Technological Innovation is the Way to Cultivate Academic Team

The development of academic authority and teacher cannot be apart from technological innovation. The ability of technological innovation is also an important criterion of measuring the academic level of teachers. On the basis of national key research base and significant research project, the research university can organize science-researching group in the way of undertaking scientific research task. And in this way, the university can arrange human resources more effectively. When in the course of research, their sense of innovation, managing ability, cohesiveness will be strengthened, and their business-level will rise up. In this way, there will be more and more researching leaders and outstanding researching groups.

1.4 Technological Innovation is the Main Approach to Strengthen Economic Power of Research University

More funds are needed not only for fast development of Research University but also for attracting and keeping more talents. In the course of technological innovation, the research university can apply for more researching projects and more funds and then turn the academic achievements into real productivity. Besides distinct economic benefit and social effect, it can bring a lot of funds to strengthen economic power of Research University.

2. The Sense of Technological Innovation for Research University

2.1 The Task of Technological Innovation for Research University is Serving Economic Construction

Technological innovation can be divided into two aspects: knowledge innovation and technical renovation. The knowledge innovation, namely original innovation, has long been considered as an important symbol of measuring science level of university. However, considering the actual condition of our country’s economy development and modernization construction, we should make a reasonable arrangement of the researching power

of university between knowledge innovation and technical renovation. While emphasizing on the importance of original innovation, we should reconsider the relation between knowledge innovation and technical renovation. In fact, they promote each other. The result of knowledge innovation, “discovery”, interacts with the fruit of technical renovation, “invention”—the achievements of original innovation bring great progress for human society and promote the development of applied science; the continuous development of technical renovation will inevitably have more requirements to the fundamental science research.

In the research of new high-technology nowadays, a lot of original innovations, namely fundamental researching tasks, come from applied research. If a university ignores appliance innovation, it will never get the support from the society and, as a result of inadequacy of funds, will feel hard to develop. The university should get out of the ivory tower, and all the research should serve national economic and social development.

In the process of promoting technological innovation, universities, especially research universities of high quality, should not only become the source of knowledge innovation in the state, but also become incubating center of technical renovation and high-technology industries. At present, some Chinese research universities have already got foundation and qualification to achieve leap-over style development in some fields. The state can choose some high-quality research universities as experimental innovation bases. In the way of deepening the reform of university researching system, advantages of multi-subjects, intersection and abundance of talent resource will show. We should increase input in basic facilities of research and promote combination of knowledge innovation and technical renovation in resource arrangement and policy orientation, so that we can leap on to a higher level.

2.2 The Focal Point of Technological Innovation for Research University is Improving Innovation Ability of Producing in Enterprises

Research University has abundant technological innovation resources and huge underlying strength in technical renovation. Up to the year 2001, there were 286,000 people involved in technological activities taking on about 121,000 subjects. There were 241,000 research workers in 5,090 researching institutes in universities approved by responsible departments. But compared with the research-transfer ratio no less than 30% in developed countries, the ratio in China is only about 10% to 15%. Many scientific and technological achievements with prospect of industry are laid aside and neglected.

Technical renovation is an important aspect in technological innovation. Considering the condition of our country nowadays, the key section of technical renovation is the renovation of products. It mainly refers to the activity that enterprises make use of new knowledge, new technology, new skills, new producing styles and new producing and managing mode, in order to improve the product quality, develop new kinds of product, and strengthen ability to compete in the market. Therefore, the kernel of product innovation should be enterprises. Strengthening renovation of product has decisive sense to improve the quality and benefit of economy and reinforce the international competitive ability. Along with appearance of various economic sectors in China, the flourishing middle and small enterprises have played a vital role in making GDP and export. Making full use of product innovation ability of enterprises to offer stamina to regional economy should be a focus and important strategy in university technological innovation today.

So, it has promising future to organize the scientific and technological strength of Research University to serve enterprises in the form of technical renovation and product innovation and strengthening cooperation. It can

develop the innovation ability of enterprises and raise competitive ability of local economy. We can make full use of research universities' advantages, such as comprehensive multi-subjects, rich foundation of talents, loosen academic atmosphere, active international cooperation. According to the demand of domestic and foreign markets, we promote cooperation between universities and enterprises. It can realize the social function that technology serves for economy in the way of talents, knowledge and achievements, building up various kinds of unions between society and enterprises. The "Silicon Valley", which was considered as "the cradle of new technology in American", developed the following way of "high-level plus strong radiation", namely nearby Stanford University and Berkeley University. In this way, university and industrial section rely on each other and promote each other subsequently, in order to reach harmonious development of research, teaching and producing.

2.3 The Foundation of Technological Innovation is Cultivating Talents

The foundation of promoting the progress of science and technology is talents. If the Chinese enterprises want to make the shift from imitative way to innovation style, they should rely on large quantities of innovation-style talents. Those new type talents should be good at lifelong study, posing and resolving questions, and they have strong sense of imagination; they should have affinity and cooperative sense; they should have strong adoptability to see what comes from a small clue, and they should be sensitive to the change of surroundings; they should be active to start an undertaking to transfer theoretical achievements into productivity; they should have strong abilities of international competition to make use of international game rule proficiently and flexibly to gain success.

For long, cultivation of innovation talents is always the weak link in China. The traditional way for the university to cultivate talents is sole instruction: the specialized courses in university are compared with an assembly line, which means a specialty is formed by a series of courses, and every course is like a machine tool. Students are considered as parts, which take the exercise through the machine tools. It has been proved by practice that it is an effective way to cultivate talents whose specialty matches their jobs but not to cultivate innovation talents. The innovation act must come from different knowledge structures, while the different knowledge structures can only be formed through distinctive studying routes.

At present, four aspects should be advocated in the course of cultivating innovation talents in the research university:

(1) Quality of intersection: Students study widely in the fields of information, manufacturing, management, economics, law, and art, etc.

(2) Quality of independence: Students have the ability to change their specialties, courses, direction of intersecting, and so on, so as to raise studying efficiency and form distinctive knowledge structure.

(3) Quality of research: Students can not only resolve problems using knowledge, but also study critically, find and pose problems.

(4) Quality of openness: Students acquaint themselves with various cultural surroundings thus to gain more internationally competitive and cooperative abilities.

The university should reform in the above-mentioned directions. They will redesign talent cultivation models with new thoughts. In the light of requirement of farsightedness and internationalization tendency, the university should carry out teaching mode that lays equal stress on knowledge, ability and quality, so as to build a multi-passage, multi-standard and modulated frame of cultivation. According to the requirements of disciplines and demands of economic and social development, the university should change its curriculum layout, build up a

reasonable knowledge structure with a wide range, and guide students to learn more in the course of research. In the way of studying in the network style, students' quality of creativity forms, which may offer wider room for growing up of students. At the same time, the university will invest more in teaching resource, promote the process of educational information, accelerate the course of connecting classroom teaching into the Web, and do its utmost to cultivate more excellent talents with rich foundation, innovation spirit and ability, and sense of international competition.

3. The Measures to Strengthen Technological Innovation for Research University

3.1 The Key to Strengthen Technological Innovation: Discipline Development

The discipline in Research University is comprehensive combinations of teaching, researching, tiptop talent cultivation, research team construction and lab construction. Through all the major discoveries and breakthroughs in science and technology, we may find that any step of progress in any aspect of society and emergence of any new and developing industry has close relation with development and innovation of a certain discipline. Therefore, the discipline construction is the key to scientific and technological innovation. It is impossible to achieve scientific and technological innovation, especially original innovation, without first-class disciplines or subjects with characteristics and innovation. The focus of discipline construction is to keep up with the tendency of science and technology development and of social development, accomplish discipline reorganization, combination, intersection, permeation and association to adjust the discipline structure, so as to form first-class disciplines or discipline teams with their own characteristics.

3.2 The Focal Point to Strengthen Technological Innovation: Team Construction

Without first-class academic teams, it is impossible to construct first-class disciplines, to cultivate first-level talents, or to make high-level scientific and technological innovation and obtain first-level achievements. The kernel of realizing scientific and technological innovation lies on academic teams, and is the wisdom and efforts of everyone. It is impossible to fulfill innovation without man, without excellent teams formed by leaders of subject and core members who have keen sense and ability.

First of all, team construction can strengthen comprehensive quality of academic teams. Teacher is the kernel of group construction. The comprehensive qualities of teachers include their academic level, potential academic ability, professional morality, sense of responsibility and cooperation. How to resolve the problem of insufficiency of high-level talents, the irrationality of talent structure and inadequate hi-level talents? How to resolve the problem of the incomplete utilization of the enthusiasm and latent capability, the insufficient organization of academic teams with overall ability and the regulation and completion of policies of talents? We should make the regulation of business, morality and act, perfect the comprehensive evaluation system of teachers' quality, reform and regulate the system of selecting, appraisal, employment, management and examining, build up competitive mechanism of competition so as to help the talents of high quality, and those with high ability or potential ability for technological innovation stand out.

Another aspect of team construction is cultivation of laboratory staff. The urgent problem to be resolved is knowledge age and instability of laboratory staff. We hope that in an open, flowing, integrating and competitive circulating system we can break through the old, close research system and the long-formed scattered pattern of organization. By the way of competition, we can realize the reorganization and structure optimization of the

laboratory staff, and build a scientific base team combining fixed and flexible posts. We should make sure that the integrality rate and the utilization rate of large, high technology, precise apparatuses are respectively kept to 90% and 80%, so as to make the best use of their high-level contribution in teaching and research.

3.3 The Guarantee to Strengthen Technological Innovation for Research University: Surroundings, Atmosphere and Systems

Innovation roots from full performance of personality, while success comes from close teamwork. Scientific and technological innovation needs not only the foundation surroundings of high-level facilities and key laboratories, but also an atmosphere where personality can be fully developed. Meanwhile, it also needs atmosphere of good, relaxed, harmonious corporation and active, unrestricted science research. It cannot be divided from the mechanism and system formed by rules and regulations, nor is it separable from the corresponding scientific and standardized management which promises scientific and technological innovation and knowledge innovation. In the way of system innovation, we will build up a system prompting contribution and restricting mediocrity, thus to make full use of college teachers' subjective initiative of knowledge innovation and technical renovation. The core of the mechanism and system construction is high fusion and unity of regulations and men. Only in the combination of system, supervision and consciousness, can we build the atmosphere and environment to "regulate study according to law, morality and rules", to ensure positive circulation of the university. Environment, atmosphere and system are the three dimensions of university technological innovation and could enable the continuous circle of "innovation-stimulation-guarantee".

3.4 The Most Direct Reflection to Strengthen Technological Innovation for Research University: the Industrialization of New High-technology

The industrialization of new high-technology which reflects the main feature of knowledge economy is the trend of modern science and technology. The effects of promoting the development of economy and society are displayed in a positive or active way. We can say that, on the premise of new high-technology industrialization, the science and technology research has run on the basis of industrialization, commercialization, and marketization. The proposition of new high-technology industrialization is the implement and representation of "science and technology are the primary productive force". It reflects that university and scientific research institution take the development of economy and society as the starting point. It is also the reflection that university wants to promote scientific and technological innovation and development. It makes close combination of science, technology and economy, linking up research and industrialization organically. We exert fundamental effect of market system and competitive system to induce scientific and technological activity. We can make circulation and management of the main body like the enterprise. So, the industrialization of new high-technology is not only the core and urgent problem in the technological innovation and development, but also another reflection of the contribution that university makes for the economic development.

University should become the incubator and powerhouse of new high-technology industrialization. The industrialization of new high-technology belongs to technology transformation, which is a phenomenon of technological economy, society and cognition. If the university wants to regulate the development of new high-technology in the system of nations, lines and itself, it should attract middle and small enterprises to do research work with high-level talents, abundant resource of scientific information and researching advantages. Therefore we can take it as the headwaters of new high-technology, and build up a series of achievements and industries. We encourage scientific research workers to cooperate with enterprises in different ways, to access the

transfer of knowledge, researching achievements and talents. We can encourage scientific research workers to make use of the mode of modern enterprise so that to increase the efficiency of spreading and adoption of new high-technology with own intellectual property right. We can encourage scientific research workers to reform traditional industry with new high-technology, and improve knowledge intensive degree and knowledge industrialization degree of traditional industry, realize the most genuine marketization, socializes, the industrialization and scale of the way that science and technology shift.

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