

Study of the Impact of the Regional Economy on the Building of a University Technological Innovation Team

—A Case Study from Henan University of Science and Technology

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ABSTRACT: The issue of the extent of the impact that regional economic development has on the building of a university technological innovation team has been a focus of discussion and research. This article, based on a case study from Henan University of Science and Technology, uses organizational environment theory to analyze the relationship between the building of a local university technological innovation team and the regional economy, and then proposes recommendations: to establish a diversified collaborative innovation mechanism and build a high-level research platform, give play to the dominant position of enterprises' technological innovation and build a high-level team for technological innovation, introduce and cultivate high-level technological innovation talent and complete universities' public service systems.

KEYWORD: Organizational environment; Regional economy; Universities; Technological innovation; Team building

1 INTRODUCTION

The Decision to Implement the Layout Plan for Scientific and Technological Development and Enhance Independent Innovation Capability released in 2006 clearly states that 'China should rank among innovative countries by 2020'. To build an innovative country, we must make technological innovation capability an important evaluation index. Universities, integrating the functionality of knowledge innovation, production, dissemination and application, have moved towards the margins to the center of society and have become the 'mother ship' for the production of scientific knowledge. (Lv & Hou, 2006) Local colleges and universities are the backbone of technological innovation in China, charged with shouldering the important mission of developing talent and regarding technological innovation as a primary task, thus they play an irreplaceable role in promoting the regional economy. (Chen, 2004) However, impacted by the economic factors that affect the regions that local universities are located in, a number of difficulties encountered by talent team building in local universities have increasingly become an important factor that restricts the universities' efforts to build technological innovation teams. This article utilizes the viewpoint of organizational environment theory to analyze the problems encountered by local

universities' as they work to develop technological innovation teams, and attempts to find strategies to respond.

2 THE LEVEL OF REGIONAL ECONOMIC DEVELOPMENT INFLUENCES UNIVERSITIES TECHNOLOGICAL INNOVATION

In his Theory of Organization, Richard Scott described the relationship between organization and the environment as follows: the organization is interdependent with the environment in many aspects and the environment is the most important among five factors for organization construction. Any organization is surrounded by an open environment, and this open environment directly influences the results of organization operation. Organization, in turn, influences the cognition and decision-making towards the environment to a great extent. (W.L. 2002) Nowadays, no organization can ignore its links with the environment. The environment influences the organization, while the organization also changes and chooses the environment.

Local colleges and universities refer to a variety of institutions of higher learning governed by local governments, located in prefecture-level cities and

administrated by provincial or prefecture-level governments, the development of which is constrained by the regional economy. In comparison, local universities and central-subordinate universities assume different historical tasks and missions, the latter of which focus on solving the overall and forward-looking major objectives in support of the national economy and technological innovation development, so they represent the highest national level, while the former shoulder the historical mission to comprehensively enhance and promote the local economic and social development level given the biggest feature of each locality. (Xu. & Fang 2012, Dong & Zhang 2007). As one of the important birthplaces of technological innovation, technological innovation team building in local universities plays a full-scale role in promoting regional economic development.

2.1 Economic backwardness impacts universities' access to funds

The availability of universities' scientific research funding has a strong causal relationship and relevance to the level of regional economic development. Although the state has related regulations and requirements for the proportion of local governments' R&D expenditures according to GDP, due to great differences in the revenue of local governments, the investment from various local governments into higher education has no direct correlation to local governments' degree of attention and efforts. (Ding. & Hu, ,2012) In February 2004, the Action Plan for Invigorating Education 2003-2007 issued by the Ministry of Education particularly pointed out that to truly improve the higher education administrative system 'double administrated' by the central and provincial governments and 'mainly administered by provincial governments'. Financing sourced from central funds is primarily directed to funding for central-subordinate institutions of higher education, while the funds for local universities are primarily sourced through local regions. The difference in levels of school operating funds between central and regional universities is the true reason for the obvious disparity in the success of technological team building between these types of institutions.

Henan University of Science and Technology, located in Luoyang, Henan Province, was founded in Beijing in 1952, moved to Luoyang in 1956 and renamed the Luoyang Engineering Institute, then successively affiliated with the Ministry of Agricultural Machinery, the Ministry of Machinery and other departments. In 1998, it was transferred to Henan Province and implemented the leadership system of 'central- and local- joint development, mainly administrated by the locality'. Into the new century, the Henan Provincial Party Committee and

Provincial Government have implemented the strategy to 'develop Henan Province through science and education' in order to prioritize the regional layout of higher education in the Province by establishing a comprehensive engineering-based university in Luoyang—Henan University of Science and Technology. Since it was founded six decades ago, the university's capabilities and level of talent cultivation, scientific research, social service, cultural inheritance and innovation have been improving, with remarkable achievements in both reform and development. However, because in general Henan Province still lags far behind economically developed regions, the environmental resource constraints have resulted in 'out-at-the-elbow' funding for school operations and research. The serious shortage of school operating funds and extremely limited technological innovation funding have resulted in a serious decline in the university's comprehensive strength.

2.2 Backward economy's impact on universities' talent development

Studies have shown that success in many scientific achievements and scientific and technological innovation has a high degree of correlation with the availability of scientific research funds, which indicates that scientific funding plays an important role in promoting the growth of high-level scientific and technological innovation talent.(Tao.& Cai.,2013) The level of regional economic development sets a higher requirement for the quality and quantity of talent needed, and significantly promotes the introduction of high-level talent. On the other hand, possessing high-level talent will drive the regional economy to rapidly develop and improve, so the two facilitate each other but also restrict each other. Regional economic backwardness weakens the locality's economic status. The ability to attract high-level talent gradually erodes and ultimately causes deterioration in the collective quality and quantity of talent in the location, thereby forming a vicious cycle which reduces the region's ability to grow innovation. (Sun. & Gai., 2008)

The building and gathering of high-level talent teams also create a 'Matthew Effect', which makes it difficult for high-level talent to flow to economically backward regions. Humans have social needs, and high-level talent needs social recognition and self-realization. First, when working in universities in economically backward areas, high-level scientists and innovators feel it is difficult for them to obtain the social status they deserve, which causes a huge psychological gap. Secondly, restricted by the inadequate overall school operating budget, it is difficult for high-level scientists and innovators to obtain appropriate treatment and thus they will

encounter difficulty in their material life. Thirdly, the regional economy does not support adequate research funding, so it is difficult for high-level scientists and innovators to give play to their expertise, thus it is difficult to make achievements in technological innovation. The direct result of these factors is that local universities are not able to attract high-level talent, which lowers the quality and quantity of high-level talent working in local universities. Even if high-level talent a lack of funding makes it difficult for them to devote themselves to their work, thereby reducing their work enthusiasm and work efficiency.

2.3 Talent shortage results in low levels of technological innovation

Regional economic backwardness results in inadequate funding for school operations and technological research, which then limits local universities, ability to attract high-level talent. The shortage of talent results in low levels of technological innovation. Enhancing the level of technological innovation in local universities must rely on the strategy of developing universities through talent, the key to which is to own a high-level teaching staff and some master-level academic leaders. The former president of Harvard University, Conan Christopher, once said: ‘The honor of a university does not lie in its schoolhouse or the number of people it serves, but in the quality of generations of its teachers. If a university wants to stand firmly, its teachers must be excellent’. (Tao., 2013) The 18th NPC report points out: ‘Technological innovation is the strategic support for enhancing socially productive forces and overall national strength, which must be placed at the heart of overall development of the nation’, so it is essential to implement an innovation-driven development strategy. As a local university, Henan University of Science and Technology is also a vital force for technological innovation and it plays a huge promotional role in local economic development. In such a symbiotic system, universities’ ability to build technological innovation teams seems increasingly important.

3 THE IMPACT OF LOCAL UNIVERSITIES’ TECHNOLOGICAL INNOVATION ON THE REGIONAL ECONOMY AND INDENTING

According to the theory of interdependence between organization and environment, the most effective ways for an organization to become associated with its environment is a theoretical theme increasingly addressed by researchers. An organization often has fairly characteristic control over the products it makes, but the result represents the common

consequence of interaction between organizational behavior and environmental response. (W.L.,2002) In other words, local universities, as organizations, should direct their own development so as to contribute to the improvement of the economic level of the locality.

3.1 Science and technology innovation platforms should integrate into regional economic development

An effective method of cooperation for local universities in support of regional economies is to establish enterprise-based, university-assisted technological innovation platforms guided by the government. As a result, national-, provincial- and municipal-level cooperative innovation centers, engineering technology centers, engineering labs, key labs and other technological innovation platforms of various specialty classifications can emerge. In areas with low-level economic development, capital and talent teams are both unable to achieve the best combination. So they cannot blindly pursue size and completeness but instead, should scale their objectives according to resources of the local economy and target industrial enhancement to focus on establishing corresponding technological innovation platforms in support of the region’s main industries. Technological innovation platforms are a necessary condition for enterprises and university teachers to carry out technological innovation and product development, along with innovations in hardware that can guarantee and enhance the quality of technological quality. When establishing technological innovation platforms, we should fully consider and demonstrate the development needs and directions of the regional economy and use limited funds where they are most needed. Thus, establishing technological innovation platforms that are scientific, rational and adaptable to regional economic development needs is the top priority.

3.2 Science and technology innovation projects should integrate into enterprise needs

Another way for local universities to serve the regional economy is through school-enterprise cooperation that focuses on the actual demands of production as a relevant technological innovation project. In the R&D process of school-enterprise cooperation projects, enterprises and universities have very complementary technological innovation resources—enterprises can contribute capital, production, production test equipment and premises, while universities can contribute high-level scientists and innovators, technical information and laboratory equipment. In the process of cooperative projects, enterprises and universities have a clear mechanism

for allocating cooperative research results and clarifying their contractual relationship and interest relationship. In this way, cooperative projects can be implemented more smoothly and will eventually result in higher performance.(Cao. et al.,2013). During the cooperation process with enterprises, local universities should strive to expand the initial loose, short-term, low-level cooperation into close, long-term and high-level cooperation.

3.3 *Innovative technology team-building should serve the regional economy*

Local colleges and universities should also directly or indirectly provide service to the regional economy and social development. It is necessary to consider the characteristics of the regional economy from a macro level, take into account the needs of industries within the regional economy to develop relevant policies for attracting skilled workers, establish a featured method for cultivating technological innovation teams, satisfy the real needs of the society by pursuing actual effectiveness in team building, and effectively integrate universities' talent development initiatives into local social development objectives. Therefore, while determining targets for building technological innovation teams, local universities should take into full account the economic development needs of the region where the university is located. While preparing a talent pool that is sufficient to serve the local economy is the target, it is equally important to set up a talent introduction and training program, establish technological innovation teams that can adapt to and promote regional economic development, and cultivate outstanding university students who can be trained to fill economic development needs.

4 CONCLUSIONS

In accordance with its own characteristics and its location in a region that has a relatively backward economy, Henan University of Science and Technology actively explores and tests strategies and methods to enhance the university's programs for building innovation and technology teams.

4.1 *Establishing diversified collaborative innovation mechanisms and building a high-level scientific research platforms*

Led by the government, it is required to strengthen the collaborative innovation cooperation between government, universities and enterprises. In recent years, although Henan Province's proportion of R&D expenditures in GDP has been rising, with our R&D investment representing 1.11% in 2013 and

reaching a historical high, we still lag far behind developed areas. Therefore, the government still needs to increase investment in R&D, while simultaneously encouraging corporate investment and attracting social support, to form a diversified technological innovation development system with government investment as the guide, corporate investment as the main body and social capital providing extensive support, to fully play out the government's coordinating and guiding functions and attract more social capital to technological innovation. At present, the university has established 36 national- and provincial-level key labs, engineering technical research centers and humanity and social science research centers including 'the state key laboratory for heavy mining equipment' and 'the tribology and material protection engineering research center of the Ministry of Education', and owns two Henan Provincial collaborative innovation centers –'advanced manufacturing of machinery and equipment' and 'genetic technology of -ferrous metals'. These technological platforms have gradually formed into a number of new growth points to guide technological development in the future, thus substantially enhancing the local capability for technological innovation.

4.2 *Giving play to enterprises' dominant position in technological innovation and building high-level technological innovation teams*

Renowned economist Li Yining said: most companies should own their own independent innovative strength, with which they can base themselves upon their own products and the level of technological progress to occupy the market, so dynamics mainly lies in innovation. Hao.(2014). In terms of building high-level technological innovation teams, local universities should fully consider the dominant idea of corporate benefit-oriented, focus on giving play to enterprises' dominant positions in technological innovation. In technological innovation team building, universities should actively guide the R&D direction of key technological projects to closely integrate with the realities of production. The university now has built 13 national- and provincial-level technological innovation and teaching teams including the advanced wear-resistant materials Changjiang Scholars and Innovation Team of the Ministry of Education. These teams have all formed technological innovation strategic alliances with enterprises and formed long-term cooperation mechanisms for sharing resources and results.

4.3 *Introducing and cultivating high-level technological innovation talent and improving universities' public service systems*

In terms of talent development, universities should work closely with local governments' public technological service systems, and take into account the characteristics of regional economies to determine how to place highly trained scientists and innovators. Local governments should take the initiative to guide the technological staff in universities' scientific and technology institutions to actively get involved in the transformation of scientific and technological achievements in ways that enhance the institutions' innovation vitality. Among 2,235 existing full-time teachers at Henan University of Science and Technology, there are 944 teachers with senior professional technical positions, 809 with doctorate degrees, 7 shared academicians, 2 central-plain scholars, 11 provincial professors, 61 doctoral tutors, and 249 senior talents who are national experts and Henan Provincial outstanding experts recognized by the 'Million Talents Project'. In order to promote the transfer of more technological innovation into real productivity, the university cooperates with Luoyang Productivity Promotion Center, Luoyang Private Enterprise Federation and other public service organizations to provide innovative enterprises with information, technology, laboratory tests and other supporting public technological services, which not only promotes the rapid adoption of technological results in support of increased productivity, but also enhances the high-tech content of innovative enterprises' products, thus improving enterprises' market competitiveness. In terms of personnel training, the university focuses on cultivating students' innovation awareness and innovation practice. It carries out the Students Research Training Program (SRTP) annually, university students' innovation production contest, graduates' innovation funding projects, academic forums, scientific and technological results incentive funds and other projects. The university provides the capital, location, equipment and materials for the

students to extensively carry out technological innovation training, so as to further create an innovation atmosphere for the campus and increase the spirit of innovation to stimulate university students' creative drive, enhance their innovative awareness and increase their technological innovation capabilities.

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