DISCIPLINARY CONSTRUCTION IN LOCAL ENGINEERING HIGHER INSTITUTIONS TRANSFORMED FROM CENTRAL DEPARTMENTS

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ABSTRACT
In 2000, China made university management system adjustments and a batch of single-subject engineering higher institutions were classified under the local government management. These higher institutions mostly adopt the disciplinary construction idea of high-level applied research orientation. Data surveys show that this idea has effectively improved the university disciplinary construction level. Taking Shijiazhuang Tiedao University as an example, this paper summarizes the disciplinary construction efficiency since it was transformed into local higher institution and proposed the idea of technological innovation leading to knowledge innovation. In key projects, its scientific and technological innovation capacity is improved and it is an efficient means to promote the subject level’s rapid development of single-subject engineering higher institutions.

Key word: University Management System Adjustment; Scientific and Technical Innovation; Industry Demand.

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1. DISCIPLINARY CONSTRUCTION IDEA IN LOCAL ENGINEERING HIGHER INSTITUTIONS TRANSFORMED FROM CENTRAL DEPARTMENTS

In 2000, China made university management system adjustments. Except Ministry of Education and few special industry departments, most central departments do not manage higher institutions. Under the background of this policy, batches of single-subject engineering higher institutions originally belonging to central departments were classified under the local government management. Their disciplinary construction levels are relatively high and own distinct features. However, disciplinary construction work after the system transformation lacks successful experience.

The general orientation of scientific researches is an important aspect of the top-level design of universality disciplinary construction. Only when this problem is solved can specific scientific work have a main direction and hardware and software resources be reasonably allocated, and disciplinary construction be developed with fewer efforts [1]. Most transformed local engineering higher institutions adopt the disciplinary construction idea of high-level applied research orientation. Detailed ideas manifest as follows.

1.1 Technological innovation leading to knowledge innovation

In view of the overall national innovation system, higher institutions play a dominant role in knowledge innovation and enterprises play a leading role in technological innovation. Thus, higher institutions shall carry out more fundamental researches. However, from the university science and technology innovation level and the function of serving regional economy and society, it can be seen that the science and technology innovation of transformed local higher institutions shall focus on technological innovation leading to knowledge innovation, finding and extracting scientific problems on the basis of applied research development.

First, the conditions of transformed local higher institutions are more suitable for technological innovation. The untransformed local higher institutions have profound foundation and long-time accumulation in fundamental theoretical researches but transformed local higher institutions have weak fundamental theoretical researches. It is impossible to develop highest-level original innovation. It is no sense to emphasize knowledge innovation one-sided [2]. At the same time, transformed local higher institutions also own certain research foundation and good innovation potential. It is a proper choice to take them as the medium of theoretical research and practical application.

Second, one of the guiding thoughts of developing university management system adjustments in China is to guide better service area economic social demands. We shall clearly see that at present technological innovative ability and whole technology standard of Chinese enterprises still are at a low level and enterprises has not been the main body of technological innovation really. This situation is more obvious in regional scientific and technological innovation system [3]. In this case, higher institutions shall provide important supports for improving enterprises’ technological innovative ability.

Again, applied fundamental research is the extension of technological innovation. Technological innovation usually is carried out specific to special industry. Only establishing long-term in-depth cooperation with enterprises can higher institutions
have a chance to understand the core technical requirements of specific fields, creating conditions for finding science-related issues. Most transformed local higher institutions own profound industry backgrounds. Accumulating on the original service area based on early technological innovations is beneficial to achieving higher-level research results.

Therefore, technological innovative abilities of transformed local higher institutions shall be fully exerted. Only in this way can proper entry point be found to service regional economy and society and at the same time can it conform to the spiritual nature of the national higher education reform.

1.2 Scientific researches facing major engineering practice

Shijiazhuang Tiedao University was formerly affiliated to Ministry of Railways. It has distinct features and foundation in scientific researches on railway transportation industry. In recent years, the railway leap-forward development provides precious historic opportunities for the rapid promotion of scientific research level. After Shijiazhuang Tiedao University is transformed, the general thought of scientific researches is determined to actively serve railway transportation industry. In the major engineering practice, scientific problems are found and extracted. By aid of improving scientific and technological innovation capacity to promote the subject development, it is a realistic choice of the university under specific historical conditions.

(1) Major engineering practices provide enough scientific research funds for higher institutions. Scientific research funds as material basis is the necessary conditions of developing scientific research work. Government departments at each level provide abundant fund guarantee on fundamental research input, but the technological innovation input is relatively insufficient. Therefore, a quite big proportion of scientific research funds in higher institutions come from enterprises. Nearly 80% of scientific research funds of Shijiazhuang Tiedao University directly come from railway industry and high-level scientific research achievements are inseparable from fund support.

(2) Major engineering practices provide research objects. With the rapid development of railway transportation industry, numerous new structures, new materials and new processes in engineering structure construction leads to that engineering practices in engineering construction and operations management fields usually are ahead of theoretical researches. Key technology in major projects becomes the first to be solved problem in technological innovations. Apart from solving this kind of problems, deep scientific problems of technical problems still need further extracting. Moreover, scientific problem tackling combined with major engineering is the necessary conditions of joint studies with other scientific research institutions. For national key projects hosted by higher institutions in recent years, whether 863 projects and National Science-technology Support Plan Projects focusing on engineering application or 973 projects and National Natural Science Foundation Key Projects focusing on theoretical exploration, their topic backgrounds all originate from major engineering practices. Over 2/3 scientific research projects of higher institutions are directly from engineering practice and numerous scientific achievements also are directly applied in national key projects. Successively 8 National Prize for Progress in Science and Technology are obtained.

(3) Major engineering practices provide a platform for exercising scientific researching teams. Under the constraints of various factors, talent introduction conditions of higher institutions cannot attract numerous high-level scientific research
talents and the research team building need to be trained by higher institutions themselves. Higher institutions organize research groups focusing on important and difficult problems of engineering technology and encourage talents to devote themselves to engineering practices. Where there is a railway key project, there are researchers of Shijiazhuang Tiedao University. When solving the technical questions of these key projects, the scientific research ability of teachers in the research group is improved and more possibilities are discovered in the new subject cultivation of the university. For example, in the study of long and large tunnel constructions under permafrost and plateau hypoxia in Qinghai-Tibet Plateau, Shijiazhuang Tiedao University sent teachers in tunnel engineering, geotechnical engineering, geological engineering, and ventilation engineering to jointly carry out studies and new tunnel construction technology and environmental control research direction are condensed. The research achievements are awarded with National Outstanding Prize for Progress in Science and Technology.

2. DISCIPLINARY CONSTRUCTION ACHIEVEMENTS OF TYPICAL TRANSFORMED LOCAL HIGHER INSTITUTIONS

State Council Academic Degrees Committee put forward the reform program of degree-conferring authorization method in 2008, and proposed project approval of Doctor’s degree-conferring authorization during 2009-2013 [5]. 53 higher institutions in China have been approved to construct and 33 of them are transformed to local science and technology higher institutions.

According to social and economic demands of Hebei province and the development of colleges and higher institutions, Shijiazhuang Tiedao University and Hebei United University were approved as Doctor’s degree-conferring authorization construction unit. Both higher institutions are transformed into local engineering higher institutions. At present, these two higher institutions pass the conferring authorization construction acceptance and officially obtain Doctor’s degree-conferring authorization qualification.

The selection and acceptance of Doctor’s degree-conferring authorization construction unit fully prove that the disciplinary construction foundation of local higher institutions is solid and its construction level is promoted obviously. This paper takes Shijiazhuang Tiedao University as an example to illustrate the disciplinary construction achievements in recent years.

In 2009, Shijiazhuang Tiedao University in Hebei province was approved as new Doctor’s degree-conferring authorization project approval construction unit, taking civil engineering, transportation and transportation engineering as to-be-authorized subject and mechanics and computer science and technology, and management science and engineering as supporting subject to construct. Since the project approval construction, taking railway transportation industry as breakthrough point, Shijiazhuang Tiedao University enhances its scientific research ability. Its rapid development of characteristic scientific researches promotes the disciplinary construction, which guarantees the smooth construction of the approval construction.

Among the Doctor’s degree-conferring authorization higher institutions of Hebei provincial university construction order and national project approval construction, the overall scale of Shijiazhuang Tiedao University is relatively and the fundamental theoretical researches are weak. Thus, under the current academic assessment system, there is certain deviation between social assessment and university overall strength [4]. Though Doctors’ degree application faces difficulty, higher institutions resist the
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construction mode of blind expansion. Small and beautiful disciplinary construction is made on traditional subjects, transportation and transportation engineering and civil engineering. Higher institutions carry out scientific problem tackling of railway transportation industry major engineering practice and fully utilize various favorable factors and external conditions, realizing key breakthroughs of disciplinary construction and working out a connotative development road with characteristics.

After transformed to local higher institutions, Shijiazhuang Tiedao University obtained national-level science and technology awards, national-level teaching achievement prize, Heliang&Heli Award, Thomson Reuters Research Fronts Award and others, in total of 14 awards. Moreover, Shijiazhuang Tiedao University hosts 7 national key scientific research projects and trains 1 academian and 1 national outstanding youth and introduces 1 Changjiang scholar.

At the beginning of 2013, Doctor’s degree-conferring authorization construction unit of Shijiazhuang Tiedao University passes acceptance and it smoothly obtains doctor’s degree authorization in civil engineering and transportation and transportation engineering. The investigation on to-be-authorized subjects in some higher institutions of national project approval construction indicates that the scientific research of Shijiazhuang Tiedao University is at a high level and detailed data are shown as Table 1.

Table 1 Statistics of scientific research of Doctor’s degree to-be-authorized subjects in China

<table>
<thead>
<tr>
<th>Index</th>
<th>Average of all subjects</th>
<th>Average of engineering subjects</th>
<th>Average of all subjects in Shijiazhuang Tiedao University</th>
<th>Rank of Shijiazhuang Tiedao University</th>
</tr>
</thead>
<tbody>
<tr>
<td>national science and technology prizes</td>
<td>0.37</td>
<td>0.56</td>
<td>1.5</td>
<td>3</td>
</tr>
<tr>
<td>Host times of national science and technology prizes</td>
<td>0.12</td>
<td>0.16</td>
<td>0.5</td>
<td>3</td>
</tr>
<tr>
<td>Province or ministry science and technology first prizes or above</td>
<td>1.23</td>
<td>1.13</td>
<td>2.5</td>
<td>2</td>
</tr>
<tr>
<td>Host of province or ministry science and technology first prizes or above</td>
<td>0.87</td>
<td>0.69</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Host of national projects</td>
<td>22.71</td>
<td>22.80</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>Host of national key projects</td>
<td>0.96</td>
<td>1.13</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Host of major horizontal projects</td>
<td>0.88</td>
<td>1.63</td>
<td>6.5</td>
<td>1</td>
</tr>
<tr>
<td>Contract funds of scientific research projects (RMB 10,000)</td>
<td>2731</td>
<td>3813</td>
<td>9061</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes: 1. Statistics are from the publicized materials of provincial-level academic degree officials and data of 48 higher institutions are collected (53 higher institutions in China with project approval).
2. Detailed data listed in the publicized materials of each university are collected.
3. Averages of the applied engineering subjects by higher institutions are used to rank.
2. PRACTICE OF SCIENTIFIC AND TECHNICAL INNOVATIONS OF SHIJIAZHUANG TIEDAO UNIVERSITY IN MAJOR ENGINEERING PRACTICES

The practice of this university’s project construction process proves that attaching importance to solving the key scientific and technical problems of enterprises and industrial development, being brave to undertake urgent, difficult and dangerous research tasks and promoting scientific research level under the guidance of high-level applied researches are efficient means to break through local single-subject engineering higher institutions’ scientific and technical innovations.

3.1 Solving the urgency of railway industry development

For Shijiazhuang Tiedao University, its function of serving railway industry is inherent. No matter how management system changes, the scientific research shall firstly be based on railway for a long time, deep integrating the development of railway industry scientific research system and conquering the urgent core scientific and technical issues of railway engineering construction.

The construction of high-speed railways in China achieves remarkable achievements. From infrastructure construction, high-speed rail line structure is primarily bridges. The establishment of bridge construction technology and equipment system is the urgency of high-speed rail construction. Shijiazhuang Tiedao University owns years’ theory accumulation and practical experience in this aspect. Independently developed SPI300/40 bridge girder erection machine owns the maximum weight and modern technical performance in the 20th century and its successful development firms the Ministry of Railways’ confidence of the domestication bridge transport and erecting equipment. The follow-up products continue to remain the original technological advantages and its lifting capacity reaches 1,300 tons, realizing non-standard beam assignment and overcoming bridge-tunnel connection section, minor radius, large longitudinal slope and various engineering environments. It accounts for 1/3 market share of domestic bridge girder erection machine, providing powerful guarantee for high-speed rail construction.

3.2 Smoothing away difficulty of enterprise key project tasks

Scientific and technical innovations are carried out on the basis of railway industry, mainly solving the technological problems of railway construction enterprises in key projects.

China’s railway tunnels firstly adopted TBM independent construction in 1995. Then TBM system was huge and its high failure rate and large cutter wear greatly restricted the technological problem of tunneling efficiency. Our university took the lead in developing studies on TBM safe and efficient tunneling technology and established safe and efficient tunnel construction machinery condition monitoring, fault diagnosis and maintenance technical system. They had been successfully applied in Qinling super-long railway tunnel of extremely hard rock, Southwest railway Taohuapu and Mogouling tunnel of long-distance weak surrounding rock, Yunnan Nagqu diversion tunnel and other major projects. Especially, the world longest Liaoning Dahuofang diversion tunnel reaches the world modern level, with 88% equipment availability and over 40% tunneling utility, creating the world records of traversing over 70% weak surrounding rock by open-type TBM.
3.3 Preventing risks of engineering disasters

With the increasing railway engineering in China, disaster accidents during the construction and operation periods of projects frequently occur because of frequent occurrence of geological disasters, performance degradation of engineering structure, long-term overload service. Thus, health monitoring of large-scale infrastructure projects becomes more and more important.

Our university firstly put forward the research direction of safety security techniques with focus on railway transportation infrastructure and created railway bridge safety security techniques with core of long-term monitoring, safety assessment and quick repair. After the demonstration application in the first dual-purpose long-span low tower cable-stayed bridge, Wuhu Yangtze River Bridge, it has been further popularized and applied in the safety monitoring and disease treatment of speed-up railways, heavily loaded railways, and high speed railways and many bridges. It overcomes the key technical problems of long-term monitoring system stability, health diagnosis real-time and structure recovery rapidity and independently develops long-distance automatic monitoring and stability assessment system of frozen earth railway roadbed in extremely severe environments, realizing the condition monitoring of 550km frozen earth roadbed of Qinghai-Tibet Railway and application in Hada, Haqi, Nenlin, Chaimu and multiple frozen earth roadbed engineering. All these guarantee the full play of frozen earth railway train operation safety.

3.4 Undertaking historical mission

Shijiazhuang Tiedao University is former Chinese People’s Liberation Army Railway Corps Engineering Institute. Studies on national defense communications are a vital mission of our university since the period of military school. Whether in the period of military school or in the period of department-affiliated and province-affiliated higher institutions, studies on the theories and technologies of railway transportation emergency security obtain great inheritance and development in our institute.

After transformed into local high institutions, to continue exerting the important functions of serving national defense communications, Shijiazhuang Tiedao University founded National Defense Communications Institute on the basis of original repair teaching and research office after the approval of National Transportation Combat Readiness Office and became the only scientific research unit occupied in national defense transportation emergency security researches among local higher institutions.

National Defense Communications Institute in our university developed emergency structure load-sharing theory and the study on rapid assembly structure technology became the host of the first National Prize for Progress in Science and Technology. Specific to railway recovery, numerous repair reinforcement equipment was developed and C-300 weapon bridge equipment developed by our university is the only missile accompanying bridge, which solves the maneuvering problems of strategic weapons in low-level bridge war zones and has been listed in the army. The dismounting trussed beam full-span transportation and erection equipment hosted and developed by the university solves the tedious assembly of dismounting combat readiness repair steel girder and slow erecting speed. Thus, 40,000 tons of repair steel girder in the combat readiness warehouse become the major device of railway combat readiness repair.
3. CONCLUSION

China made university management system adjustments in 2000 and a batch of single-subject engineering higher institutions were classified under the local government management. These higher institutions mostly choose high-level applied research-oriented disciplinary construction mentality. Data surveys show that this idea has effectively improved the university disciplinary construction level. Taking Shijiazhuang Tiedao University as an example, this paper summarized the disciplinary construction efficiency since it was transformed into university and proposed the idea of technological innovation leading to knowledge innovation. In the critical project, its scientific and technological innovation capacity is improved and it is an efficient means to promote the subject level’s rapid development of single-subject engineering higher institutions.

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REFERENCES


