The Present Situation and the Train of Thought on the Development of Enterprise, College and Research of Henan Province

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Science and technology are the first productive forces. The college and university give great contributions to the knowledge-able and economic society. The first contribution is to train highly qualified personnel; the second is to produce new knowledge; the third is the contribution to industry. Therefore, the college and university are the units that can create, process, spread and apply knowledge. They play a major role in knowledge economy. The combination and development of present enterprise, college and research (i.e., meeting the developing trend of science, technology and education integrally) are essential characteristics of changing from a planned economy to a marketing economy, finally making science and technology become the first productive forces. This paper introduces the developing situation on the Enterprise, College and Research Project (ECRP) of Henan Province.

THE DEVELOPMENT OF HENAN ENTERPRISE, COLLEGE AND RESEARCH (ECR)

The success in developing and implementing ECRP results in an accumulation of science and technology to some extent. Generally speaking, the large enterprise groups with enormous strength and R&D structure, the university with high academic level as well as the major engineering college, are the first chosen objectives for overall cooperation. In surveying the development and operation of HECRP in general, the following characteristics will be stressed.

First, technology transfer is the major form of cooperation, accounting for 2/3 of the total. The technical transfer expenses is lower due to the close relationship between the enterprise and college: it is the preliminary form of cooperation.

Second, the successful cases of cooperation have the obvious advantages of subjects and experts. This shows the importance of economic and academic accumulation on cooperation to a great extent. Today, science technology as well as the economy are developing integrally in the whole world. It is reported that the world scientific and technical achievements have been most shared by USA and European countries. A few industrialized countries master 80% of the achievements. Every country races to control the commanding point on science and technology of 21 century through occupying the market. An essential invention must be supported by enough funds and equipment with the development of science, technology and economy. It can only be realized in the enterprises with better condition, college and research institute. If there are no advantages in subjects and experts, the technical standard could not control the commanding point in case there exists cooperation. It is obviously hard for successful cooperation.

Third, the colleges with successful cooperation have the stronger advantages in basic research. Their projects belong to the ones of State natural science funds or papers published in SCI. Some colleges have gained many experiences with the breakthroughs in high and new technology. This fully shows that the basic research is the source of the high and new technology and industry improvement. The college and university, with better basic research, generally speaking, have done better work in technology application and development, having the feature of developing theory and technology simultaneously.

Fourth, there exist obvious regional features: i.e. the close combination in the development between successful cases and regional economy.

Fifth, the relationship of college-mates and regions are fully utilized.

Sixth, the cooperation between college and enterprise, except very few colleges and universities, is in small scale, having not formed group advantage as well as with strong "united" advantage.

SOME PATTERNS OF COOPERATION AMONG ENTERPRISE, COLLEGE AND RESEARCH (ECR)

1. The Pattern of Henan Mechanic & Electric Engineering College—Pattern of Major Breakthrough

The combination of enterprise, college and research in Henan Mechanic & Electric Engineering College is developed quickly though it starts rather late. The College has chosen cooperative education and cooperative technology as major breakthroughs, making rather large progress, having received favorable comments from state educational committee, provincial educational committee as well as enterprise field. They consider this is the correct direction for the enterprise development and educational reform of Engineering College.

For the cooperation between the enterprise and the college, the College, in accordance with the requirements of the enterprises, applies for new subjects, draws out educational plan, compiles the textbook and trains the students together with the enterprises. The College adopts the "2+1" pattern: i.e. the students study in the college for the first two years; they go and study in the enterprises in the later year. The enterprises will choose the best graduates for their working stations. At present, there are 5 subjects.

What the College did is:

1. Set up cooperative structure (Board of Directors).
2. Draw up the cooperative article of association.
3. Sign cooperative contracts annually.
4. Set up cooperative mechanism.
5. Strengthen the cooperative achievements.

2. The Pattern of Zhengzhou Grain College—Pattern of Technical Contract

Zhengzhou Grain College is the country's
have been raised. Both parties have helped to raise the consciousness of marketing and sales as well as new products development and the consciousness of product quality, and the consciousness of regions, and the consciousness of scientific development. At the same time, the quality of the work of young teachers has become outstanding. The cooperation has been spread in an integral combination with enterprise, college and research.

The scientific and technical development, technology transfer and qualified personnel training have been managed together in the College during ECR cooperation. The cooperation has been spreading in recent years. The contract volume has exceeded hundreds of thousands RMB, concerning technology transfer, technical consultant as well as technical service, feasibility demonstration, etc. The cooperation is distributed all over the country. For example, Grain Engineering Department—except in Hong Kong, Macao and Taiwan—all the provinces in China have the grain mills designed or modified by the College. The College has gained high reputation and it is well known in the country. During the cooperation, they make use of their own synthetic advantages insisting on the principle of mutual benefits and mutual development. The teachers, scientific and technical personnel of the College fulfill the lack of scientific expenses, largely strengthening the scientific development ability, enlarging the practical knowledge, enriching the teaching contents, training the qualified personnel. Many excellent young teachers have become outstanding. At the same time, the quality of the workers, the consciousness of product quality, as well as new products development and the consciousness of marketing and sales have been raised. Both parties have helped and complemented each other in scientific, technical activities and production practice. They have developed steadily.

3. The Pattern of Henan University—Pattern of Overall Cooperation

Henan University, a local university with more than 80 years history, has 20 more departments of Chinese, History, Science and Technology, Economy and Trade Management, Chemistry, having two advantages in personnel, science and technology. In 1995, the University cooperated completely with Kaifeng County—having widely cooperated in qualified personnel training, scientific and technical breakthrough, technical consultant and information recruitment, etc. They developed a new cooperation pattern with multi-direction, multi-angles in university and government united, intelligence infiltration, technical guidance. The University utilized the advantage of region, selecting dozens of young and middle-aged teachers and some students, who have owned high technology, known more about economy and management, and sending them to Kaifeng County. During summer vacation, 400 students were sent to the countryside and appointed as the deputy directors in charge of technology. The County governmental consultant implemented soft-scientific research through investigation.

For the operation, Kaifeng City and Henan University have set up the joint office, responsible for the cooperative connection. The joint meeting is held once a half-year, arranged in the second half of March and September. The joint meeting (the office-deans attend) between the City and University is held once a month. The essential and key projects cooperated between both parties would be drawn out separately. It is proved that the close cooperation between the City and the University quickens the process of changing the scientific and technical achievements of the University to practical productive forces, laying a new task for the University. In the Article of Association of the Board of Directors stipulates that: “The Board will guide LEC to form a close tie with the enterprises and technical designing institutes, develop the cooperation in multi-direction and multi-levels, strengthen the ability of Luoyang City in actively fitting economic construction and meeting the need of mechanical industry development”. The main task of the Board is to draw out and implement the policy and provision for ECR cooperation, and to coordinate the relationship between the College, relative enterprises and research institutes. In the practical work, part-time professors and technical advisers are employed among the College and director units. They train Engineering Masters together, making widely cooperation in science and technology, getting much more progress. They have made a wide cooperation in adult education and close cooperation in enrolling and distributing students.

5. The Pattern of Zhengzhou University & Henan Normal University—Pattern of New and High Technology (NH-Tech)

Zhengzhou University, a university with actual strength, has obvious advantages in the fields of new style medicine, industrial catalyst, intelligent medical apparatus, industrial automation—control, etc., especially the first three have formed the characteristics of their own college-running. In the pattern of ECR cooperation, the University breaks a new way of new and high technology (NH-Tech) mainly. NH-Tech has strong advantages in the cooperation of enterprises and colleges, industrial realization due to its breakthrough in the previous industrial structure. However, NH-Tech may have more risk.

There are two factors affecting the industrialization of NH-Tech. One is large investment, such as investing in new medicine development, generally speaking, the university and college cannot afford these expenses. Another is the lack of testing condition and the means of industrialization. In these respects, Zhengzhou University pays more attention to the market investigation, choosing the suitable direction on scientific research, seeking the supports from the enterprises in many ways, from strengthening the ECR combination. The University cooperated with Xichuan Pharmaceutical Factory, Jiaozuo No.1 Pharmaceutical Factory, one after another, realizing the industrialization of new medi-
cine results. In 1992, the University and Henan Oil Field together invested 10,000,000 RMB, founding a Pharmaceutical Factory of Zhengzhou University in Zhengzhou New and High Developing Zone, getting a new realm on ECR combination.

Henan Normal University, having strong advantages in science and engineering subjects, researched and developed MH/Ni cell and relative material, with Huanyu Power Co., Ltd., adopting the circling pattern of supply for item—small test in laboratory—medium test in factory—industrialization, from the view of demand of the enterprises in 1991, reducing the distance between research and actual production, solving the problem of long term separation between the library research and production manufacturing as well as technical developing industrialization. It can be said that NH-Tech has much more profit repaying on the transformation of scientific and technical results. Therefore, it is the best choice for the enterprises. At present, the economic situation has changed from selling market to buying market, the way of NH-Tech industrialization walked by Henan Normal University and Huanyu Power Co., Ltd., is better fitted this change. The way for the demand of market, on the purpose of enterprise development and NH-Tech industrialization is the major pattern for the future cooperative development on ECR cooperation.

TRAIN OF THOUGHT AND PROPOSAL ON THE ECR DEVELOPMENT

1. Close connection with small and medium enterprises

The small and medium enterprises in China play an important role in the national economic development. However, they lack qualified scientific and technical personnel, facing the situation of aged products and slow products renewing. Zhengzhou Grain College cooperated with many small and medium enterprises in difficulties, successfully working out a cooperative way. The College freely transferred the technology for the small and medium enterprises in difficulties. They gained mutual benefits in the long-term cooperation. Having a close connection with small and medium enterprises, it is significant for the colleges with common technical strength.

2. Setting up ECR Group, raising the actual strength of technical breakthroughs

Setting up ECR group can mutually complement the subject advantages, high, medium and low technical research, raising the actual strength of technical breakthrough to:

4. Cooperative running college, modifying and transforming the subject structure

At present, the managing expenses of the universities and colleges can not meet the demand of themselves and their subject structure can.

5. Perfect the protection system on intellectual property right of ECR cooperation, solving the profit distribution in law form.

At present, the law of intellectual property right in China is being refined, supplying an essential and lawful basis for the ECR profit distribution. However, the consciousness for intellectual property right of the whole society is weaker. So, when perfecting the stipulation and provision for the intellectual property right of ECR cooperation, train the department leader, technical personnel and technical workers in the knowledge of intellectual property right.

6. Setting up the governmental funds for ECR cooperation

With the ECR cooperation, both the universities and technical units hope more technical fruits can enter the market, producing economic benefits so as to push the better circle of technical research and teaching work. On the other hand, small and medium tests will be made for technical fruits changing to practical productive forces, large amounts of money will be invested. However, the enterprises are worried about the unsuccessful transformation. If the government can set up a risk fund for cooperation, playing the roles on guiding, coordinating, servicing, etc., the ECR cooperation can be developed more quickly and to a great extent.

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