Construction of Internal Market of R&D Achievements transformation of Large-scale SOE

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Abstract. The transformation of R&D achievements is a key link for large SOE (State-owned enterprise) to implement national innovation and development strategies and accelerate R&D innovation.
Large-scale SOE have accumulated a large number of R&D achievements. But most of the achievements have not successfully transformed into industrial products. The transformation channels amid R&D, industrial and application units within the SOE group have not been built efficiently, which is mainly due to the fewer high-potential achievements, the narrower transformation channels and the weak motivation of transformation.
Based on an in-depth analysis of the status and problems of SOEs’ R&D achievements transformation, this paper introduces the concept of “market transactions”, proposes an internal market construction plan and organization system for the transformation of SOEs’ R&D achievements which contain a total of 2 types of 3 conversion modes. Also, this paper clearly defines the function orientation and main work of each units, which provides channels for the transformation of its R&D, industrial and application units, promotes the realization of the value of R&D achievements, and improve its R&D efficiency.
This paper contributes to the improvements of the large-scale SOEs’ R&D achievements transformation mechanism, to the acceleration the implementation of science and technology development planning, and to the strategic management of R&D innovation.

1. Analysis of the Transformation of R&D Achievements of Large-scale SOE
Generally, a large SOE has its R&D units, industrial units, and application units. For example, China Aerospace Science and Technology Corporation (CASC) currently has 8 R&D institutes, 11 professional companies, 12 listed companies, and several directly-owned units.
State Grid Corporation has 26 provincial companies, 23 directly-owned industrial companies, and 5 directly-owned R&D institutions. It also has its own R&D institutions in 26 provincial-level power grid companies. A large number of R&D achievements have been made within the State Grid Corporation, and there are many application companies who have technical requirements, thus there are high potentials for the transformation and application of R&D achievements internally. However, due to the shackles of institutional mechanisms and imperfections of related systems, there still remain some problems in R&D transformation.

1.1. Fewer R&D achievements have actually been transformed
Although the transformation of R&D achievements are part of the large-scale SOE R&D project, most R&D projects merely focus on the technological sides, neglects the parts of transformation, meanwhile
lacking of related experience, which leads to the immature from industrialization and the high cost of secondary development.

Take the State Grid as an example. From 2011 to 2014, two of its directly-affiliated R&D units produced about 964 R&D achievements, but only a few dozen have been transformed industrially, which is a extremely low transformation ratio.

1.2. Narrow transformation channel
Most of the SOE’s R&D achievements do not have many transformation channels. Firstly, the ongoing transformation of achievements are mainly pushed by enterprises-level planning and assessment, which have strong administrative characteristics, while not by market demand. Less. Secondly, most of the SOE have not yet established mature market-oriented transformation mechanisms both internally and externally. Greater breakthroughs need to be established in organizational structures, regulations, and systems.

1.3. Incentive mechanism is not perfect yet
The R&D institutes and industrial units under large SOEs mainly pay attention to assessment indicators, such as the scale of R&D funds, achievement award ratio, and technical service satisfaction level. There are fewer returns from achievements transformation and technology market transactions. Technology-based R&D mechanisms based on results-based transformation have not yet been established.

The research orientation of R&D units is mainly based on technical services and basic frontier research. Under the condition of lack of effective incentive measures, it is difficult to mobilize the enthusiasm of actively achievements transformation.

2. Research on the construction of the internal market for the transformation of R&D achievements of large SOEs

2.1. Construction ideas
In order to promote the transformation of R&D achievements of the large SOEs and improve the efficiency of the transformation of the achievements, on the basis of the in-depth analysis of the current situation and problems, this paper explores the construction of the transformation market of the internal results of the central enterprises. The general idea is, based on the concept of marketization, to change the function orientation of management departments, to establish a market-oriented system mechanism, and jointly promote the realization of the internal trading market.

Firstly, based on the concept of marketization, this paper tries to construct the internal trading market. Through the introduction of intermediaries or the improvement of direct transaction mode, to promote the achievement producers and the applications to conclude transactions.

Secondly, to improve the system and mechanism of the market. By changing the functions of the centralized management departments, to give full play to the service and supervision functions of the management departments, to mobilize the enthusiasm of both sides of the transformation, and to promote the smooth progress of the transaction.

2.2. Overall pattern of the internal market construction
According to the characteristics of the internal resources and the typical problems of the transformation, large SOEs are expected to propose methods of building the internal market, to improve the efficiency of the utilization of internal resources, and to promote the application of the transformation of R&D achievements. The overall pattern is shown in Figure 1.
Figure 1. Construction of R&D achievements transformation market of Large-scale SOE.

Research units are the producers of achievements, and industrial units and application units are the applicants of achievements. 2 categories and 3 transformation channels are established between producers and applicants. The 2 categories refer to the transformation of direct transformation and through intermediary agencies (R&D achievements transformation service company), in which the direct transformation can adopt two modes: contract and joint venture.

2.3. Function orientation and key tasks of each units

2.3.1. Headquarter

In the transformation of R&D achievements in the internal market, the features and functions of the headquarters of large SOEs should be changed and adjusted accordingly.

Firstly, the role of headquarters have to be changed. During the construction of the transformation market of R&D achievements, following the idea of "transformation of government functions", headquarters properly play the role of policy makers, propagandists, market attendants and regulators.

Secondly, the decisive role of the market in the achievements transformation has to be emphasized. Responsible management departments in headquarters reduce administrative planning and arrangements, and decentralize management authority on specific operations of transformation.

Thirdly, the guidance and support role of headquarters in the transformation has to be strengthened. The responsible management departments promote the orderly and effective operation of the internal market by setting up platform and building mechanism, strengthening service and reasonable supervision.

Fourthly, the boundaries between "market" and "management" has to be gradually explored. In the process of internal market operation, the headquarters need to make various policies based on thorough and in-depth grass-roots research, to implement pilot demonstration before expansion of pilot and comprehensive promotion, and to continue to optimize the operating environment of the internal market.
2.3.2. Research service units
In the construction of the internal market, the corporation should introduce research service companies as an intermediary for the transformation of R&D achievements, which can play the full role of market intermediaries.

The positioning of research service units is as specialized technology trading & service companies which connect research units and application units. The service companies should be regulated by the responsible departments of headquarters, which is a bilateral service platform for the transformation of achievements, promoting the connection of supply and demand sides of R&D achievements.

The main function of the platform is to provide professional operation services for both supply and demand sides, including market information service, research consultancy service, legal consultation service, feasibility evaluation of transformation, price assessment of R&D achievement, credit evaluation of both parties, and financing services.

The key tasks of technology service companies are:
Firstly, to the legal entity has to be founded and the corporate governance structure has to be perfected. The chairman and supervisors should be appointed by the department of research management in headquarter.

Secondly, the service company has to be operated as a profit center. The responsible management department should carry out the strategic management control and financial control over technology service companies, record the transaction information, and delegate the powers of HR and resource allocation to service companies. The management department should set up KPI targets based on the number of transformation, operating income, and operating profit. Also the department should establishes flexible investment exit channels.

Thirdly, a free trading mechanism has to be established. Principally, it is not compulsory to transform R&D achievements through technology service companies within the corporation, which could force the service companies to improve their service level.

Fourthly, to prepare to be the internal professional service units aimed at promoting the internal achievements to the external markets.

2.3.3. Research unit, industrial units and application units
In the construction of the internal market, research unit, industrial units and application units should have changed accordingly in terms of organization structures and functions.

Firstly, transformation centers or offices should be set up within the industrial units, research units and the provincial companies. These centers or offices are responsible for the transformation of the results of their own units. They are also responsible for the release of the achievements / demands of their units, and the connecting of external cooperation, and technology services on the intellectual property operations.

Secondly, research units should establish an incubation platform for achievements transformation, which can play the functions of internal achievements incubation, external joint incubation and achievements transformation connecting.

3. Conclusion
Among the internal research units, industrial units and application units within large SOEs, because of restraint of the institutional mechanism and the imperfection of the system, there are many problems, such as the unimpeded channels of the transformation of achievements, the lack of willingness to transform, and the imperfect evaluation system.

On the basis of analyzing the current situation and problems of the transformation of the internal achievements of large SOEs, this paper puts forward the methods to establish transformation channels for internal R&D achievements within the large SOEs, which could promote the transformation and application of internal achievements. This paper provides two categories and three methods of transformation, which will provide the transformation methods for the research units, the production
units and the application units. This paper also clarifies the function transformation and key work of the headquarters management department under this market environment.

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