

The Development Direction of Research on Chinese Technological Innovation

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Abstract. The theoretical study of Chinese technological innovation assumes the perspective of prototype structure of scientific being, and consists of four directions of investigations: ontological study of innovation cognition, behavior study of innovation cognition, subjects of innovation cognition, and subjective material foundation of innovation cognition. The study aims to obtain technological innovation capacity through construction of an external technological innovation system. However, an external system would necessarily result in redundancy of systems and decreased operability. For the purpose of environmental friendliness and resource conservation, it is vital for our technological innovation to ignite the intrinsic innovation vitality of the system. Therefore the endogenous mechanism of innovation is the scientific direction to take for the theoretical study of technological innovation.

1 Introduction

A review of literature shows that the study of Chinese technological innovation consists of nine directions - underlying patterns of innovation behavior, concepts of innovation cognition, methods of innovation, behavior of innovation subjects, structure of innovation mediators, innovation capacity, public service system of innovation, policy support system of innovation, and cultural environment of innovation, as well as several issues of innovation, including its behavior mechanism, operational mechanism, work mechanism, modes of implementation, modes of mathematical representation, modes of physical representation, modes of behavioral representation, modes of performance representation, modes of function realization, modes of structure realization, modes of workflow realization, modes of carrier realization, etc.

When faced with such a multi-faceted system of achievements, we must carefully consider how to organize it into a theoretical system of technological innovation that can provide guidance to innovation projects. We intend to formulate a prototype structure of scientific being (PSSB) of technological innovation, and implement it in our investigation of Chinese technological innovation achievements and analysis of its future development.

2 Explore of technological innovation science being prototype framework

From the perspective of PSSB, China innovation theoretical research falls into four strata (see Figure 1).

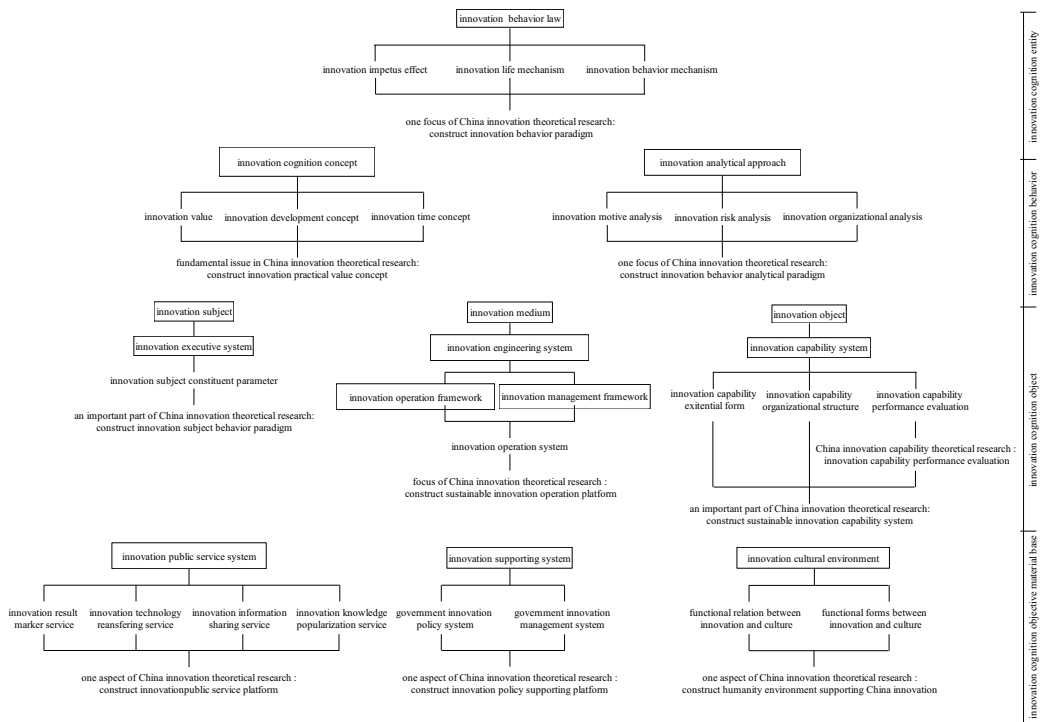


Fig. 1. The construct of technological innovation’s PSSB.

2.1. Innovation cognition ontology

Around the law of innovation behavior, the impetus effect , life mechanism, behavior mechanism of innovation are explored. To construct innovation behavior paradigm becomes the focus of China innovation theoretical research.

2.2 Innovation cognition behavior

Consisting of innovation cognition concept and innovation analysis approach. Centered around innovation value, innovation development concept, and innovation time concept, the exploration and construction of innovation application value has become the fundamental problem in China innovation theoretical research. And taking innovation motive analysis, innovation risk analysis, innovation organization analysis as our objects, to explore innovation analysis approach and construct innovation behavior analysis paradigm becomes the focus of China innovation theoretical research.

2.3 Innovation cognition object

Consisting of innovation subjects, innovation medium, and innovation objects. Innovation subject refers to innovation implementing system. China scholars, based on the research of individual personality, behavior discrimination, behavior factors of innovation subject and leading ability of innovative leaders, gradually found the constituent parameters. So the exploration on innovation subject behavior paradigm on this base is an important part of China innovation theoretical research. Innovation medium refers to innovation engineering system, including innovation operation framework and management framework. Around innovation operation framework, china scholars discussed structuralforms of innovation organization, constructing paths of innovation behavior , innovation operational mode and innovation working platform. Around innovation management framework, China scholars discussed innovation developing strategy, behavior strategy, operation mode, and management system. Based on the innovation operation framework and innovation management framework, to construct a sustainable innovation operation platform composed of innovation operation tool, procedure and workshop is a heated issue in China innovation theoretical research. Innovation object refers to innovation capability system composed of forms of innovation capability, structure, performance evaluation. Around innovation capability forms, China scholars discussed innovation working forms ,organizational forms, representing forms, demonstrating forms. Around innovation capability organization structure China scholars discussed organizational constituents , structural function, transmission forms and constituent mode of innovation. Around innovation capability performance evaluation, China scholars discussed the assessment

mechanism, mode, index, and system of innovation. To construct innovation capability performance evaluation system is also another heated issue of China innovation theoretical research.

2.4 Innovation cognition objective material base

Composed of innovation public service system, innovation supporting system and innovation cultural environment. Around innovation public service system, China scholars have discussed innovation result marker services, innovation technology transferring services, innovation information sharing services, and innovation knowledge popularization services. To construct innovation public service platform is one aspect of China innovation theoretical research. Around innovation supporting system, China scholars discussed government innovation policy system and government innovation management system. To construct innovation policy supporting platform is another aspect of China innovation theoretical research. Around innovation cultural environment, China scholars discussed the mutual relation and its forms between innovation and culture. To construct a humanity environment supporting China innovation is a third aspect of China innovation theoretical research.

3 Technological innovation operation framework

The major object of present China technological innovation theoretical research lies in constructing sustainable innovation operation platform. If innovation subject can be divided into innovation impetus subject, innovation idea subject and innovation implement subject, the thinking way of China technological innovation research and systematic research can be generalized as following: the innovation idea subject, guided by innovation development concept, based on the adjust of innovation policy supporting system, put forward innovative idea; innovation impetus subject, guided by innovation time concept, based on the support of innovation public service platform, initiated innovative activity; innovation executive subject, according to innovation impetus subject requirements and innovation subject innovative idea, guided by innovation value, based on innovation behavior paradigm and innovation behavior analysis paradigm, launched innovative activity on the sustainable innovation operation platform and construct innovation engineering system, hence obtained innovation capability system eventually. (see Figure 2)

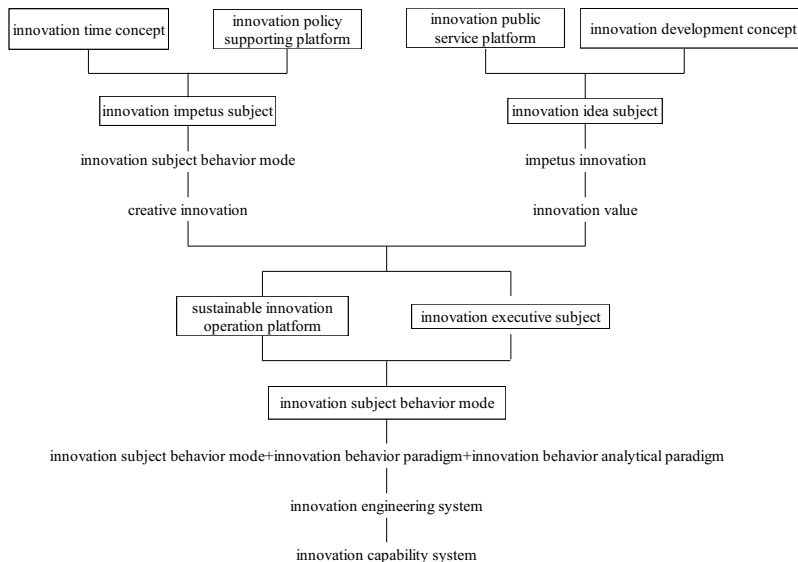


Fig.2. Thinking route of China technological innovation theoretical research and engineering application.

Innovation engineering system is attached existential scientific practice system (science research system, technology developing system, engineering operation system), productive practice system , or social practice system, and enables these practical system innovative function which is called exogenous innovation system.(see Figure 3)

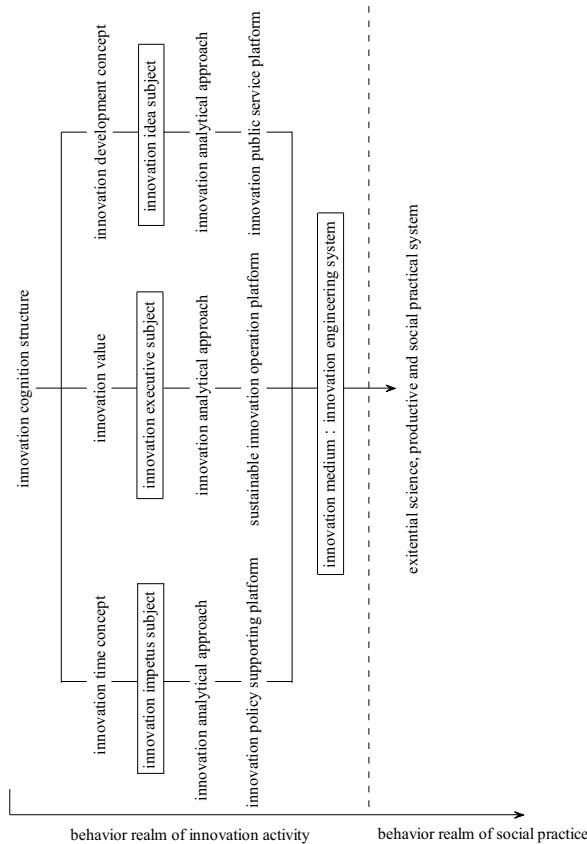


Fig. 3. Exogenous Technological Innovation System.

4 Discussion

From the perspective of Prototype Structure of Scientific Being(PSSB) [1], we can find that related theoretical achievements of technological innovation research are developed around innovation science being prototype framework, and constructed exogenous innovation practice engineering system, and reinforced the innovation capability of engineering system.

The above innovation operation framework seems to be a perfect function system. However, when observing it from the history of human civilization and the history of science, we can easily come to a conclusion: the history of human development itself is a perfect example for a history of innovations in civil activities, culture, science, technology, and society. As for this we can understand thoroughly from A History of Science by Dampier [2], History of Western Philosophy by Weber [3], Dictionary of History of Science by Bynum [4], Natural Philosophy by Hegel [5], Human Knowledge by Russell [6], A History of Science, Technology, and Philosophy in the Eighteenth Century by Wolf [7], Furthermore, a large number of historical facts prove that the scientific gains are increasing greatly on a geometric series scale and are generating massive achievements, which is specially verified in both Theoretical History of Science and Technology by Song Ziliang [8].

All the above facts sufficiently indicate that social practice system, or productive practice system or scientific practice system which in itself has powerful innovation capability, and creates abundant and colorful social civilization, production civilization and scientific civilization. Furthermore, our social practice system, productive practice system and scientific practice system have already presented the situation of accelerating innovation development, and we are living in a great knowledge-explosion era.

In light of this, the question we should raise is why we need to establish an artificial innovation engineering system out of the existing scientific practice system, productive practice system and social practice system? Have the original systems lost their innovation capability? Or are there any defects in the innovation functions of the original systems?

Among various practice systems, there must be numerous concrete individual systems in which the innovation functions have been restrained, shielded and obstructed for various reasons and accordingly results in the problems of losing or weakening of the innovation functions of practice systems, thus compelling us to address the issues of technological innovation research or rebuilding of technological innovation systems. According to the analysis from the

perspective of control principle, the addition of auxiliary systems in the case the original systems are able to work (but with their functions possibly weakened) will certainly cause system redundancy and increase the control difficulties. Considering from friendly environment and resource saving, it may be an optimal choice to restore the original system functions.

So, we need to consider the following questions: how to restore the innovation functions of the original systems? How to stimulate the innovation functions of original systems? How to exploit the innovation functions of the original systems? How to magnify the innovation functions of the original systems? And how to perfect the innovation functions of the original systems.

Now we need not only to attach importance to the structure of and study on the exogenous innovation system, but also to the social practice system to look into the endogenous innovation functions of the system itself, including studies on the endogenous mechanism, operational mechanism, behavioral system and working model of system innovation, and on the reasons why endogenous innovation has been restrained, shielded and obstructed, and further including the researches on the mechanism to impel, revitalize, boost and extend the endogenous innovation functions of system.

In the end, the scope of theoretical research on technological innovation will expand from the single study and discussion on the exogenous innovation system to discussion on the endogenous mechanism and operation model of innovation, and there will be a wider field and space for the innovation research.

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