



The Function of the State in the National Innovation System in Some Developed Countries and Valuable References for Vietnam

Nguyen Trong Binh, Academy of Politics Region IV, Can Tho City, Vietnam,
Email: trongbinh195@yahoo.com

In the current time of knowledge economy, globalisation and changing times, the capacity to innovate is decisive for the development of a country. The Government of Vietnam affirmed that innovation is the driving force of development and a key factor for rapid and sustainable development. As a country in transition, to promote innovation in Vietnam, it is necessary to solve many different problems, in which the State's positioning of the right function and good implementation of the role in building a national innovation system is of particular importance. In this context, it is necessary to study the function and role of the state in building the national innovation system in some countries around the world, thereby drawing some experiences for Vietnam. By clarifying the concept of the national innovation system, this study mentions and analyses the experiences of some developed countries in building the national innovation system, thereby drawing some suggestions for Vietnam.

Keywords: *National Innovation System; Some Developed Countries; Reference Value, Vietnam.*

1. NATIONAL INNOVATION SYSTEM: DEFINITIONS AND STRUCTURE

a. Michael Porter calls the strategy of economic growth based on innovation and innovation "development strategy based on innovation" (Innovation-Driven Economy). To a very large extent, the ability to innovate, especially the scientific and technological innovation capacity, is the decisive factor for national dominance and competitiveness (Porter, 1990). In recent decades, countries around the world attach great importance to promoting scientific and technological innovation, enhancing the combination of scientific and technological innovation with economic growth; at the same time setting out many strategies, policies and

measures to promote innovation. In this context, the national innovation system is an issue that increasingly attracts the attention of many countries around the world as well as theoretical researchers.

The concept of the national innovation system was first introduced by C. Freeman Richard R. Nelson in 1987. According to Richard R. Nelson, “In terms of institutions, national innovation systems are relatively complex. These include institutional and behavioural factors, both of which include institutions, such as universities, and public funds and planning that focus on the development of knowledge and science and technology. In which, business is the core and center of the national innovation system” (Richard R. Nelson, 1993). C.Freeman said: “The national innovation system is an organizational network made up of the public and private sectors, and their activities and interactions promote the formation, adoption, innovation and Applying new science and technology” (C.Freeman, 2002). He is particularly interested in four important elements of the national innovation system: the role of state policy; roles and efforts of enterprises, research organisations in research and development; the role of education and training; and career structure.

The 1997 OECD's “National Innovation System” report states: “Innovation is the result of the interplay of different actors and organizations. The transformation of science and technology is not based on the perfection of the linear model, but the result of the mutual feedback and interaction between elements within the system. The core and center of this system is the enterprise. The national innovation system is a way for business organisations to create, innovate and gain outside knowledge. The main source of external knowledge is other firms, public or private research institutions, universities and intermediaries” (OECD,1997). Thus, according to the OECD, enterprises, science and technology organisations, universities, and intermediary organisations of science and technology services are the constituents of the national innovation system. The OECD also classifies the national innovation system into four main parts: knowledge innovation systems; technology innovation systems; knowledge enhancement systems; and knowledge application systems (OECD,1999). Metcalfe said, “The national innovation system is a network and system comprising members of different fields (such as business, research institutes, universities, government and international organizations) working independently or cooperatively in the formation, development and increase of knowledge” (Metcalfe, JS, 1995). In the view of Fagerbeg, Mowery and Nelson, “the national innovation system consists of systems and organizations. This system includes factors such as government policies and regulations, interactions between schools, business and the public sector responsible for innovation” (Fagerbeg, Mowery, Nelson, 2006).

From the above concepts, it can be said that the national innovation system is an institutional network (enterprises, universities, scientific research institutions and government) participating in the development and application process of new knowledge, new concepts,

new methods as well as the interaction between the institutions in this network to promote the creation, accumulation, and transfer of new knowledge, technology and products.

The national innovation system has several characteristics: (i) the core of the national innovation system is innovation. As the core of the national innovation system, innovation is of particular importance to economic growth as well as social development and progress. Specifically, innovation changes the way of thinking and behaviour of people, stimulating human creativity enthusiasm. Innovative activities are the decisive factor for the advancement of science and technology. It is also the factor directly promoting social development. (ii) The national innovation system is not only the basis and driving force for sustainable development but also a key factor to foster and develop high-quality human resources and create synergy, as well as the competitiveness of a country. (iii) Institutional design, selection and enforcement are central to the national innovation system. The national innovation system is nurtured, maintained and promoted by the state institutional system. The State can directly conduct innovation activities or create an institutional environment and conditions for innovation activities to take place smoothly. Currently, there are many different models of the national innovation system in the world, in which a typical national innovation system played by the state and the national innovation system by regulation of the market. The national innovation system in Japan is dominated by the state, characterised by the direct involvement of the state in innovation activities, and at the same time, setting out many policies and strategies to guide and promote innovation. The national innovation system in the United States is market regulation. That is, the state mainly focuses on creating a favourable environment for business innovation activities, while the market is the main force regulating enterprise innovation activities.

b. The national innovation system is composed of the following elements: the subject of innovation activities; the interaction between the actors of innovation; and international cooperation.

Firstly, the subject of innovation activity. First of all, the business is the subject of innovation activity. As the main force of research and development, an enterprise is one of the subjects of the national innovation system. Innovative activities of the business are subject to the promotion and regulation of the market. Therefore, research and development activities of most enterprises are mainly focused on technology application and research and development of new products. It can be said that business is the bridge connecting innovation results with the market. Enterprise innovation not only includes technical and technological innovation but also includes management innovation, institutional innovation, organisational innovation and cultural innovation. As a subject of the national innovation system, the enterprise's innovation capacity directly affects a country's innovation capacity. However, it is the indeterminate nature of innovation that makes businesses face many risks in the innovation



process. This is a factor that makes some businesses not bold in innovation. Therefore, the state should promulgate relevant policies to promote and guide business innovation activities.

The second subject of the national innovation system is scientific research institutions. Research organisations include a system of research organisations under universities, state scientific research institutions and non-state research institutions. Unlike enterprises, innovation activities of research organisations are often non-profit and often focus on basic research. State (or public) scientific research organisations mainly conduct research directly related to national interests and "national livelihoods". These are also high-risk, resource-intensive studies that often cannot or do not want to be conducted. The main function of research institutions is to create knowledge, spread knowledge and foster talents.

The third subject of the national innovation system is the education and training organisation. Education and training institutions are mainly universities with the main function of providing high-quality human resources for the national innovation system, especially high-quality human resources in science, technology and management. Talent training and fostering plays an important role in innovating and promoting the application and transfer of science and technology. In fact, many educational and training organisations perform the function of training human resources and fostering talents, while performing the function of scientific research. The close combination between training and scientific research of the university plays an important role in improving the quality of training of high-quality human resources.

The fourth subject of the national innovation system is the state. In the national innovation system, the state plays a particularly important role, especially the role of policymaking, creating an environment, supporting and enforcing institutions, and regulating innovation activities to promote change. The government's innovation promotion policies include three main aspects: supply, demand and environment. The main task of the state is to adjust the behaviour of the innovator, protect the interests of the innovator, maintain the interests of the state and society, and create a favourable environment for innovation activities.

The fifth subject of the national innovation system is an intermediate science and technology service organisation. Intermediate science and technology service organisations exist in the forms such as science and technology consulting organisations, science and technology research centres, technology innovation centres, science and technology parks. Technology plays a bridging role between actors in the national innovation system. Its primary function is to provide information services, finance and insurance. The activities of science and technology service organisations play the role of promoting science and technology transfer, supporting technology innovation activities for small and medium enterprises, minimising innovation costs and lowering exchange risks.

Secondly, the association and mutual interaction between the actors in the system. Interaction and cooperation between actors are important elements of the national innovation system. According to the OECD, the interplay between elements in the national innovation system plays a particularly important role in technological and scientific innovation. The relationship and the interaction between actors in the system mainly include: (i) cooperation between enterprises, mainly technology cooperation; (ii) cooperation between enterprises and scientific research organisations. Enterprises can promote the commercialisation of research results of science and technology organisations. In the other direction, some basic research achievements of scientific research organisations also create many choices for enterprises to innovate in science and technology. The cooperation between enterprises and science and technology research institutions promotes the transfer and application of science and technology; (iii) the cooperation between the intermediate science and technology service organisations with other actors in the system. Intermediary science and technology service organisations play the role of minimising the obstacles of cooperation and linkages among the entities in the system, contributing to promoting the creation and dissemination of knowledge and innovation activities; (iv) cooperation between the state and other actors. The State plays a role in creating an environment, adjusting the activities of actors, supporting policies and resources to promote the healthy development of actors and regulating innovation activities of owners.

Thirdly, is international cooperation. The national innovation system is an open system. If closed, the national innovation system will not be successful. Implementing "openness" in both the input and the output of the innovation system is one factor that ensures the strength of the national innovation system. For that reason, strengthening international cooperation, including academic and technological exchanges and cooperation, is an important content contributing to building the national innovation system.

2. THE FUNCTION OF THE STATE IN BUILDING A NATIONAL INNOVATION SYSTEM IN SOME DEVELOPED COUNTRIES

Practice in developed countries shows that the state plays an important role in building the national innovation system. In the construction of the national innovation system, the state performs many different functions, mainly the following functions:

Firstly, direct investment. The construction of a national innovation system cannot be separated from the role of direct state investment. Direct state investment can accelerate the creation, transfer, application and dissemination of new knowledge, science, technology and products. According to the OECD report, for every \$1 the government spends on research and development investments will bring about \$ 1.7 in business benefits. According to the World Bank Report, in 2013, total national spending on research and development of 28 EU countries accounted for 2.01% of GDP; These figures for the United States (2012), Japan

(2013) and South Korea (2013) were 2.81%, 3.47%, and 4.15% of GDP, respectively (World Bank, 2015).

In the United States and many European countries, the key and key science and technology projects related to defence and people's livelihood that enterprises can participate in are funded by the state. By participating in important and key research projects on science and technology, it helps businesses focus on human resources and research equipment, contributing to strengthening the science and technology innovation capacity. The OECD report shows that, in most countries, between 10% and 20% of enterprise research and development is financed by the state budget through different investment modalities (OECD, 2014).

Secondly, creating a favourable environment for innovation. Building the national innovation system requires a good environment, including innovation incentives, intellectual property policies, innovation funds, the legal system and ensuring democracy in research activities...

(i) In order to encourage and promote innovation of enterprises, investment policies, tax exemption or reduction of the state are of great importance. Investment policy, tax exemption and reduction promote innovation, research and development activities of enterprises in all fields and industries, making enterprises able to capture the trends at a certain point of time to catch up with key technology directions. The State's policy on investment, tax exemption or reduction increases the capacity to provide science and technology, creating many choices for technological innovation. Over the years, Australian laws have allowed banks to engage in direct investment in small and medium enterprise technology innovation. Also in Australia, the Department of Industry is the state regulator providing a "one-stop service" to businesses that are supported by the state in technological innovation.

(ii) Building and completing the legal system to create a legal environment for innovation is also an important function of the state in building the national innovation system. Therefore, governments in many developed countries attach great importance to the good performance of this function. In order to promote innovation activities, the United States issued many legal documents, such as: "Law on Science and Technology Innovation", "Law on Brand Classification", "Law on Priority of Science and Technology", "Law on national research cooperation"; France has issued the "Law on Basic Orientation of Science and Technology Research and Development", "Law on Higher Education", "Law on Science and Technology and Innovation of Science and Technology"; Japan has issued the "Law on Basic Science and Technology", "Law on promoting the transfer of scientific and technological research results of universities to enterprises and society", "Law on strengthening scientific capacity. technology for production"; Korea has enacted "Law to promote national science and technology"; "Law on special science and technology innovation".



(iii) In addition to the above aspects, “acknowledge and encourage everyone to have maximum freedom within the framework of the law; through freedom to innovate and unleash creativity” (Zhang Chengfu, 2014); Implementing the motto "liberating thought", ensuring freedom of thought in scientific research, especially in social sciences and humanities research is also an important content that developed countries attach importance to so as to promote innovation and creativity.

Thirdly, regulate innovation activities. Building a national innovation system requires the integration of national and international resources and strengths, of central and local state agencies, government-business-universities, and research agencies. All of this requires the State to perform well its regulatory functions. Building a national innovation system related to scientific and technological cooperation and transfer between countries strengthens the State's regulation on international scientific cooperation. Technology to promote international exchange and cooperation on science and technology both in breadth and depth is also an objective indispensable requirement. For example, the Australian Government has established the Federal Science and Technology International Cooperation Group to establish and implement a global research collaborative network. In addition to regulating international cooperation on science and technology, the state also needs to implement organic coordination and linkages between innovators: state-owned enterprises-universities-research institutions. In Japan, many large research projects are implemented through public-business-university partnership and cooperation and research institutions. Close cooperation between state-enterprises-universities and research institutions as well as strong state intervention in science and technology innovation is a prominent feature of the national innovation model in Japan. In addition, regulating the coordination between state agencies in innovation activities in general, and science and technology innovation in particular, through different modes also belongs to the role and functions of the state.

Fourthly, planning national innovation policies and strategies. Building a national innovation system requires a clear innovation strategy. The innovation strategy will set out the vision, goals, timing, steps and tasks of the construction of the national innovation system, thereby benefiting the improvement of the effectiveness of the national innovation system. Developed countries attach great importance to planning innovation strategies to guide, encourage and support innovation activities. For example, in July 1985, the European Union issued the "Euroka Plan". In this plan, the European Union has introduced the most advanced and necessary scientific and technological fields and fields of the world that need development attention, at the same time giving a strong commitment and support to science and technology innovation activities. In 1993, the United States issued a strategic plan "Nationwide Information Highway", followed a focus on establishing an intellectual property protection system, investing in key areas, education, health care and implementation of many important innovation projects. Besides, the United States has also issued many different policies to create an environment and a basis for innovation. In 1995, Japan issued the



"National Science and Technology Development Strategy", which considered science and technology innovation as the basis and foundation for the country's development. In 2001, Korea issued the "Basic Plan for the development of science and technology". In this plan, Korea has set a target for a period of 5 years to ensure that they become one of the 10 countries with scientific and technological qualifications and competitiveness in the world.

In addition to the above functions, to build the national innovation system as well as promote the enhancement of national innovation capacity, the governments of many developed countries also attach importance to the development of high-quality human resources, at the same time increasing procurement of public services from organisations outside the state, especially enterprises and social organisations.

3.RECOMMENDATIONS FOR VIETNAM

Studying the function of the state in building national innovation systems in developed countries, we can draw some suggestions for Vietnam as follows:

Firstly, considering innovation as the main and most important driving force of development, as a premise for Vietnam to develop rapidly and sustainably. Today, innovation is the main and most important driving force of development. In the past, although Vietnam has emphasised the importance of innovation, it has not seen it as the main driving force of development. Therefore, to contribute to the successful realisation of the development vision in a new period, it is necessary to strongly develop science, technology, innovation and digital transformation as the main driving force of economic growth and development.

Secondly, implementing the motto "liberate thought". The premise of knowledge innovation, science and technology innovation and institutional innovation is the birth of new concepts, new ideas and new theories. In order to get rid of the "constraint" of old ideas and old arguments, "liberation of thought" should be respected. "Liberation of thought" is a condition for a people to maintain the advance and vitality of theoretical thinking. Only "liberating thought" can get one out of the "constraint" of old perceptions, the old way of doing and propose new conception and new interpretation. Therefore, Vietnam now needs to "practice democracy, respect and promote freedom of thought in research, creation, consultation and criticism activities of scientists". In particular, it is necessary to attach importance to promoting democracy in social sciences and humanities research to ensure the rights and obligations of organisations and individuals to freely create, think, propose; to be respected, to receive opinions; to use research results in research activities according to the provisions of law (Le Huu Nghia, 2016).

Thirdly, the State must be a pioneer in innovation and set an example in the spirit of self-renewal. It is argued that an innovation country requires an innovation state (Yu Keping,



2006). The State is the holder of public power, is the subject that establishes institutions and promulgates policies and laws, so the state's "single movements" have a great influence on the public's ideology and behaviour of people as well as the stability and development of society. From this sense, the self-renewal of the state is of particular importance to the renovation activities of society and the development of society. The State's renovation creates a new atmosphere of innovation in the whole society, making innovation a social value.

Innovative activities of the state change the system of institutions and policies, thereby positively affecting all areas of social life as well as people's lives. The state's institutional reform is directly related to the quantity, quality and efficiency of innovation in all areas of social life as well as in the national innovation system. A developmental government is not only a streamlined, efficient, rule of law, accountable and integral government, but also a democratic, transparent, and innovative government.

Fourthly, continue to create a favourable environment for innovation and promulgate policies to encourage innovation activities. Innovation means new institutions, new sequences, new techniques, new theories and new methods to replace the old. This is very likely to conflict with the existing order and institutions. Innovation has a certain degree of risk. It may also fail, or it may be less successful. Therefore, it is necessary to have a legal mechanism to ensure innovation activities; it is necessary to tolerate innovative ideas and unsuccessful innovations, maintain the activeness of the innovator, thereby making innovation an important content in the daily life of society. The State needs to establish an effective incentive mechanism, ensuring human, material, financial, information and policy reforms for innovators, forming incentives strong enough to promote positivity and innovation of the organisation and its members in society. Because science and technology innovation requires a large investment and has high risks, the activeness of science and technology innovation of organisations and individuals in society is often not high. This requires the state to approve planning, finance and investment to promote innovation activities of businesses and society. Experience of developed countries shows that direct investment by the state and tax exemption and reduction policies are the main measures to encourage innovation activities of enterprises. Under Vietnamese conditions, to promote the construction of the national innovation system, the State needs to continue to improve mechanisms and policies to facilitate and promote innovation activities of enterprises, universities, and science and technology research and service organisations; to settle the relationship between the State and universities, the State and enterprises, especially state-owned enterprises, the State and scientific research organisations; and give more autonomy to public universities and public research institutions.

Sixthly, policy-making and innovation strategy. The state's innovation policies and strategies are of particular importance to the renovation activities of the whole society. This is reflected in: (i) thanks to the innovation policy of the state, the allocation of resources becomes more

reasonable, minimising the innovation costs of the whole society; (ii) implementing guidance for social innovation activities, concentrating resources to innovate in key areas, industries and areas that society needs most; (iii) make the necessary regulation for the social renewal activities, making the innovation activities of the whole society to take place in a continuous and sustainable way.

As a developing country, to realise rapid and sustainable development, it is necessary to issue an appropriate strategy for science and technology innovation. The innovation strategy should set out the technology innovation vision, objectives and directions properly, avoiding the "detour". The State needs to approve the planning of science and technology development strategies to raise national science and technology capacity and potential. In the face of new requirements, in addition to supplementing and adjusting existing strategies, it is necessary to set out strategies and plans related to science and technology, such as planning for the development of essential science and technology sectors and fields; university system development planning; organisational development planning, public scientific research agency and so on. Besides, it is necessary to focus on perfecting institutions, policies and laws in accordance with market mechanisms and international practices to develop science and technology, as well as promote the development of the digital economy and digital society. In particular, in the immediate future, it is necessary to promptly remove barriers on the legal system and economic and financial policies for science, technology and innovation creativity.

Seventhly, increasing direct investment in science and technology, especially in research and development (R&D). Over the past few years, the state has increased investment in science and technology. According to the Ministry of Science and Technology of Vietnam, in 2015, investment from the state budget for science and technology was 17,390 billion VND (accounting for 1.52% of total state budget expenditure and accounting for 0.4% of GDP) (Ministry of Science and Technology of Vietnam, 2016). Regarding the total national expenditure on science and technology, in 2013, the ratio of national spending on research and development / GDP reached 0.37%. Of the total national expenditure on research and development, the state budget accounts for 56.7% (13,390 billion VND), investment capital from enterprises accounts for 41.8% (5,597.3 billion VND), water capital outside accounts for 1.5% (VND 201.7 billion) (Ministry of Science and Technology of Vietnam, 2014). However, according to experts, Vietnam's investment in science and technology is not commensurate with the leading national policy. If South Korea invests 1,100 USD / person to do scientific research, Vietnam has only invested 10 USD. In particular, Vietnam's investment in research and development is 10 times lower than that of China, 5 times for India, and 20 times for South Korea. Therefore, increasing investment in science and technology, especially increasing investment from the state budget for research and development, and adjusting investment structure for science and technology are issues that



need to be addressed and that will contribute to building the science and technology innovation system in Vietnam today.

Lastly, in order to promote the national innovation capacity as well as build the national innovation system, it is necessary to properly address the relationship between the government and the market (business), government to society, and government and the public non-business units in the direction of giving more autonomy to business, society and non-business units.

4. CONCLUSION

Vietnam sets out a development vision that by 2030, Vietnam will become a developing country with modern industries and high average income; by 2045, Vietnam will become a developed country with a high income. In order to realise the above vision, Vietnam needs to properly attach importance to the role of innovation and development, and then focus on building an effective national innovation system. In building the national innovation system, the State has an important function and role. From the practice and experience of developed countries, it can be seen that in order for the state to function well, the key point is to focus on institutional reforms to meet the requirements of building a tectonic state for development and a good settlement of the relationship between the state, the market, and society.



REFERENCES

- C.Freeman (2002), Continental, National and Sub- national Innovation Systems: Complementarity and Economic Growth. *Research Policy*, 31(2).
- Jan Fagerberg, David Mowery and Richard Nelson, Editors (2006), *The Oxford Handbook of Innovation*, Oxford University Press, Oxford.
- Le Huu Nghia (2016), Practice and promote democracy through 30 years of renovation, *State Organisation Magazine*, No.11.
- Metcalfe, J.S(1995), Technology systems and technology policy in an evolutionary framework. *Cambridge Journal of Economics*, 19 (1), pp: 25-56.
- OECD(1997), *National Innovation Systems*.
- OECD(1999), *Managing National Systems of Innovation*.
- OECD(2014), *Science, Technology and Industry Outlook 2014*, 16-11-2014.
- Porter, M.E(1990), *The Competitive Advantage of Nations*, Free Press, New York.
- Richard R.Nelson(1993), *National Innovation Systems: A Comparative Analysis*.
- Vietnam Ministry of Science and Technology (2014), *Science and Technology of Vietnam 2013*, Science and Technology Publishing House, Hanoi, 2014, p: 83-85.
- Vietnam Ministry of Science and Technology (2016), *Vietnam Science and Technology 2015*, Science and Technology Publishing House, Hanoi, pp: 92-93.
- World Bank(2015), *Science and Technology in ASEAN Countries (Tentative edition)* - September 2015, Center for Research and Development Strategy - Japan Science and Technology Agency.
- Yu Keping (2006), An Innovative Country Requiring an Innovative State, *Comparing Socio-Economic Institutions*, No.2.
- Zhang Chengfu (2014), On Open Government, *Journal of Renmin University of China*, No.4.