INTERNATIONAL EXPERIENCES IN INSTITUTIONALIZING LEGAL PROVISIONS ON SCIENCE, TECHNOLOGY, AND INNOVATION ORGANIZATIONS IN NATIONAL LEGISLATION

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Abstract:

The comprehensive and transparent institutionalization of legal regulations concerning the science, technology, and innovation (STI) organization serves as a legal foundation for the effective management of these entities. This article focuses on analyzing the role of institutionalizing legal regulations concerning the organization of science, technology, and innovation (STI) within statutory documents. It clarifies the legal approaches adopted by several countries-such as South Korea, Japan, and Russia-in regulating STI organizations. Based on these comparative insights, the article draws key lessons for Vietnam in the process of improving the legal framework for STI in general, and for STI organizations in particular.

Keywords: *Science and technology; Innovation; Organizations; Institutionalization; International experiences.*

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1. The role of institutionalizing regulations on science, technology, and innovation organizations in legal documents

1.1. Some concepts

1.1.1. Law and legislation in the field of science, technology, and innovation

Law is a system of general mandatory rules of conduct, issued or recognized by the State, to regulate social relations in the direction of certain goals. Law represents the will of the State, has mandatory effect on all organizations and individuals, and its enforcement is guaranteed by state power.

Law in the field of science, technology, and innovation (STI) constitutes a system of legal norms that regulate social relations arising from STI activities. It ensures that this sector develops in alignment with strategic orientations, serves national interests, and contributes to socio-economic development.

The subjects of regulation are organizations and individuals participating in activities and the management of science, technology, and innovation. The scope of regulation includes principles in science, technology, and innovation activities; scientific research, technology development, and innovation activities; science and technology organizations; human resources for science, technology, and innovation,

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infrastructure, financial investment for science, technology, and innovation; policies for science, technology, and innovation development, etc. This legal system includes laws and sub-law guiding documents, such as decrees and guiding circulars.

1.1.2. Science, technology, and innovation organizations

According to UNESCO, a science and technology (S&T) organization is a system of institutions-including institutes and centers-that have the function to perform scientific research and experimental development. Their purpose is to draw scientific conclusions at various levels: these may be purely theoretical findings, experimental results, or prototypes of organizational, managerial, technical, or technological solutions.

In Vietnam, the Law on Science and Technology (2013) defines a science and technology (S&T) organization as an entity engaged in S&T activities, whose primary functions include scientific research, applied research, technological development, and S&T service provision. Such organizations are established and registered in accordance with legal regulations.

S&T organizations have the following forms: (i) Scientific research organizations, applied research and technological development organizations organized in the form of academies, institutes, centers, laboratories, research stations, monitoring stations, testing stations and other forms; (ii) Higher education institutions that organized according to the provisions of the Law on Higher Education; (iii) S&T service organizations that organized in the form of centers, offices, testing stations and other forms. In Vietnam, for research and statistical purposes, the types of scientific research organizations and scientific research and technological development organizations are often mentioned.

In addition to S&T organizations, the type of innovation organization is also often mentioned in academic forums or in lawmaking. However, up to now, there has been no legal concept of this type of organization. Basically, an innovation organization can be understood as an organization that carries out innovation activities organized in the form of: an innovation center, an organization supporting innovation and innovative startups, science and technology enterprises, innovation-driven enterprises, innovative startups...

1.2. The necessity and aspects of the role of institutionalizing regulations on science, technology, and innovation organizations

Concretizing the country's long-term development policies and guidelines

Laws become a means of institutionalizing the country's directives, orientations, policies, guidelines, and development strategies, and are a bridge between strategic thinking (guidelines) and policy actions (practical implementation). Directives, orientations, and policies are often macro-goals, but only legal regulations can concretize goals into targets, operating mechanisms, and subject responsibilities, thereby ensuring the realization of strategic goals in a feasible and measurable manner.

In the field of science, technology, and innovation (STI), at the national level, development strategies for STI are often broad, directional, and general in nature. If they are not concretized through legal instruments, they are likely to face implementation challenges and easily fall into a state of lacking enforceability.

Establishing State management tools, creating a legal corridor for the development of S&T and innovation organizations

The promulgation of legal regulations is the basis for the State to establish a unified management order for the activities of STI organizations. Legal regulations related to STI organizations create a transparent, clear, and mandatory legal framework, thereby contributing to improving management efficiency and promoting the development of this field.

Clearly defining the subjects and scope of policies.

In the STI field, the characteristics of the subjects are not limited to the legal status or individual status, but also relate to professional functions, research capacity, organizational mechanisms, and goals. STI organizations have many specific characteristics that are different from other economic organizations or any other normal organization. Therefore, the specifying regulations on STI organizations such as concepts, classifications, and their operating mechanisms, etc. will clearly define the subjects and scope of regulation of STI policies, providing a solid theoretical basis to determine the rights, obligations, responsibilities, and appropriate support mechanisms for each group of subjects according to their science, technology, and innovation activities.

Basis for designing policies suitable for the characteristics of STI organizations

The regulation of concepts and classification of STI organizations in legal documents is a condition for designing stratified policies, suitable for the capacity and characteristics of the subjects. The distinction between public research institutes, science and technology enterprises, private research centers, independent research groups, or individuals conducting freelance research activities is of key significance in designing different policy packages.

Improving the effectiveness of state management of science, technology, and innovation

The development of legal regulations on STI organizations in legal documents contributes to improving the effectiveness and efficiency of state management of science, technology, and innovation. From the perspective of public administration, the lack of clear regulations on STI subjects makes it difficult to allocate resources and evaluate the effectiveness of public investment.

Ensuring international compatibility, promoting international cooperation, and comparison.

A widely recognized legal concept not only serves domestic management but also helps to be compatible with international standards, facilitating international cooperation and comparison. If national laws define STI organizations in a similar way to international criteria, domestic data and policies will easily integrate into the

general picture of the world, and domestic organizations will also be easily recognized and linked to international research networks.

Promoting the development of STI organizations

In order for STI organizations to truly play their role in promoting STI development and contributing to socio-economic development, the State needs to have policies that create favourable conditions for the development of organizations. The promulgation of appropriate development policies plays a decisive role in the growth of STI organizations and the entire STI system.

In short, STI organizations are the main subjects in research activities, in developing new knowledge, and in applying research results to production practices, and at the same time, with the important role of institutionalizing regulations related to STI organization in legal documents as mentioned above, many countries have paid great attention to STI organizations and have included relevant regulations in highly effective legal documents.

2. Experiences of some countries in institutionalizing regulations on STI organizations in legal documents

The institutionalization of regulations on STI organizations in legal documents is given special attention by countries, with the main scope of regulation being concepts, classification, rights and obligations, and support policies for these organizations. The typical approaches of some countries are as follows:

2.1. Concept and classification of S&T organizations

2.1.1. S&T organizations

In Russia, after the collapse of the Soviet Union, the country gradually shifted to a market economy. In the S&T organization system, in addition to public organizations, private organizations and enterprises participating in S&T activities are increasingly appearing. Law No. 185-FZ (2013)[2] defines S&T organization as an organization that takes scientific or scientific and technical activities as its main function, existing in many different forms, from state organizations to private organizations.

In Korea, the National R&D Innovation Act 2020 defines S&T organizations as institutes or organizations that implement national-level R&D programs. This Act defines S&T organizations as including various types: (i) research institutes directly established and operated by the Government/local governments; (ii) universities; (iii) research institutes funded by the Government; (iv) S&T research institutes invested by the Government; (v) research institutes invested by local governments; (vi) specialized research institutes; (vii) enterprises under the Commercial Law; (viii) other institutions and organizations as prescribed by the Presidential Decree.

[2] Federal Law No. 185-FZ of July 2, 2013, on amending and repealing several legal acts of the Russian Federation related to the promulgation of the Federal Law "On Education in the Russian Federation".

Korea wants to fully cover all entities implementing R&D in the economy. The inclusion of enterprises in the group of S&T organizations reflects the fact that large companies in Korea are the main drivers of technological innovation, and the State encourages the participation of enterprises in national R&D programs.

Compared to Russia's general definition, Korea has chosen a detailed approach to create a transparent legal framework for interdisciplinary coordination and resource sharing between public and private institutions.

In Japan, the 1995 Basic Law on Science and Technology does not provide a specific definition or classification of S&T organizations. Instead, the law focuses on identifying key components of the national research network, including: research institutes under ministries and sectors; research organizations located in universities; research facilities operated by private enterprises or technology corporations. The common point of these organizations is to perform R&D functions, contributing to the advancement of national S&T. Japan's approach is like Korea's, as both countries have established a rich S&T organization system, with participation from both the public and private sectors, to maximize research capacity for the country's development goals.

In China, the 1993 Law on Progress in Science and Technology (amended in 2007, 2021) does not provide a general definition of S&T organizations, but it specifically classifies the entities that are allowed to establish R&D organizations. Specifically, they include: (i) R&D organizations using the state budget; (ii) domestic organizations and individuals according to the law; (iii) foreign organizations or individuals that can independently establish R&D organizations within the territory of China according to the law; (iv) domestic and foreign joint ventures.

This classification reflects the strategy of expanding the legal space to mobilize diverse domestic and foreign resources for research activities, while still ensuring control within the national legal framework. The legal recognition of enterprises and individuals as legitimate entities in establishing S&T organizations marks a significant shift in management thinking, from focusing on the state sector to expanding to the private sector. This correctly reflects the current development reality in China, where enterprises are emerging as the leading force in the innovation ecosystem, accounting for a large proportion of the country's total investment in R&D.

Table 1. Regulations on concepts and classification of S&T organizations of some countries

Comparison criteria	Russia	Korea	Japan	China
Concept of S&T organization	An organization whose main function is scientific or scientific and technical activities	An organization that implements national R&D programs	Not defined	Not defined
Classification of S&T organizations	No specific classification, only general identification, including state organizations and private organizations	Research institutes directly established and operated by the Government or local authorities; universities; research institutes funded	No specific classification, only identification of main subjects, including research institutes under ministries;	Specific classification of S&T organizations by founding subjects: State founded; citizens, legal

		by the Government/local authorities; specialized research institutes; companies as prescribed in the Commercial Law; other institutions and organizations.	S&T organizations under universities; S&T organizations under private technology companies and corporations	entities, other organizations established; Foreign organizations or individuals independently established in Chinese territory; foreign and domestic joint ventures or partnerships established in Chinese territory

Source: Compiled by the authors

Thus, each country has a different approach and draws a different concept and classification of S&T organizations. The common point is that they all recognize the main function of S&T organizations as carrying out R&D activities. The concepts of S&T organizations in the laws of countries also emphasize the role of S&T organizations as the core element of S&T development, not only as a place to carry out R&D activities but also as a connection role between the public and private sectors to promote innovation.

2.1.2. Innovation Organizations

Many countries in the world have laws on innovation, such as France (Law on Innovation and Research 1999, Serbia (Law on Innovation 2021), the Philippines (Law on Innovation 2018), Spain (Law on Science, Technology, and Innovation 2011);… However, in the legal documents of these countries, there is no concept of innovative organizations. In Serbia, the Law on Innovation 2021 classifies organizations/entities that carry out innovation activities as follows: centers that carry out innovation activities (development-production centers, R&D centers, innovation centers, technology transfer centers); startups; spin-off enterprises; and other innovation entities.

The absence of a common definition for innovation organizations in many countries stems from several shared reasons: the diversity of innovation organization types; the need to ensure legal regulations are more feasible and adaptable to the evolving innovation ecosystem; alignment with practical management and support for different groups of innovation organizations; and compatibility with each country's socio-economic conditions and strategic priorities

2.2. Rights and obligations of science, technology, and innovation organizations

2.2.1. Science and technology organizations

Legal documents on science, technology, and innovation of many countries, such as China, Korea, Japan, Russia, France, etc., all specifically stipulate the rights and obligations of science and technology organizations, expressed through the following contents:

- *Organizing and participating in scientific research activities*: S&T organizations are allowed to organize or participate in professional activities such as academic

seminars, scientific conferences, research seminars, etc., within the scope permitted by law.

- *Autonomy in research orientation:* Science and technology organizations are granted the right to independently determine their research directions and develop projects and topics that align with national development strategies and societal needs. At the same time, they are empowered to make decisions regarding financial management, internal organizational structure, and resource allocation to support their operations.

- *Cooperation with other domestic and international organizations:* Science and technology organizations have the right to establish cooperative relationships with research institutes, universities, and enterprises within the country as well as with international partners. Such collaboration aims to enhance R&D capacity through implementing joint programs, shared projects, and jointly exploiting and sharing resources, data, and professional expertise.

- *Receiving funding and social contributions:* In addition to state budget sources, S&T organizations have the right to receive contributions and sponsorship funding from society (non-governmental organizations, research funds, individuals) to support R&D activities. This helps to enhance financial resources and improve the capacity of S&T organizations.

- *Owning and using assets:* S&T organizations have the right to own, use, and dispose of assets according to current laws. For public organizations, in case public assets are not used, they may be leased out with the approval of the competent state management agency. Additionally, science and technology organizations are allowed to utilize the facilities of higher education institutions based on cooperative agreements. They may also establish enterprises to deploy research outcomes, apply scientific and technological achievements in practice, and carry out technology transfer activities.

In addition to being empowered to perform research, development, and technology transfer functions, S&T organizations must also fulfill legal obligations:

- *Compliance with the law and ensuring research ethics:* S&T organizations are responsible for implementing R&D activities within the scope of the law, ensuring the implementation process is transparent, accurate, and complies with professional ethical standards. Research needs to be conducted according to standardized processes to ensure the scientific nature, reliability, and applicability of the results achieved.

- *Development of infrastructure and resource-sharing cooperation:* S&T organizations are responsible for ensuring the maintenance, upgrading, and development of the system of research infrastructure, such as laboratories, scientific equipment, experimental facilities, and pilot trial production systems. In addition, they should actively participate in resource-sharing mechanisms with other organizations to promote cooperation and optimize the use of equipment and research resources. This approach not only contributes to cost savings but also contributes to improving the quality and efficiency of research activities.

- *Public asset management:* This includes the leasing of unused public assets that the organization does not use, but must ensure that such activities do not violate State regulations.

- *Human resource management and protection:* S&T organizations must ensure the rational use and development of S&T human resources; select personnel, determine salaries, and appoint individuals to professional titles; and foster a healthy working environment that encourages creativity within the research team.

- *Fulfilling financial and tax obligations:* S&T organizations, especially non-profit organizations, are responsible for fully fulfilling their financial and tax obligations as prescribed by law. At the same time, these organizations may be subject to preferential tax policies by the State to support non-commercial R&D activities, thereby contributing to the development of science and technology.

- *Being responsible for sustainable development and international cooperation:* S&T organizations are obliged to maintain and develop the research system in a sustainable manner, while strengthening cooperation with international organizations and actively participating in global S&T programs and activities, ensuring full compliance with international commitments that the country has participated in.

- *Reporting on the implementation of commitments:* S&T organizations are responsible for reporting on the implementation of commitments and the achievement of the organization's goals to the management agency.

In summary, it is essential for countries to stipulate the rights and obligations of S&T organizations in legal documents to establish a clear legal basis for the formation and operation of S&T organizations. However, the scope of rights and obligations of S&T organizations in each country is different, depending on the political regime, the level of S&T development, the level of autonomy of the public research sector, and the national strategic STI orientation. This reflects the flexibility in designing policies suitable to the development characteristics and management requirements of each country.

2.2.2. Innovation organizations

In that context, the countries increasingly attach importance to the central role of innovation organizations in knowledge-based and technology-based economic development, and institutionalizing regulations on the rights and obligations of innovation organizations in legal documents has become an inevitable trend. Many countries, such as the Philippines (Innovation Law 2018), Serbia (Innovation Law 2021), France (Innovation and Research Law 1999), and Spain (Science, Technology, and Innovation Law 2011),... have established a legal position, ensuring that innovation organizations have access to rights and perform corresponding legal obligations. According to the laws on science, technology, and innovation of countries, innovation organizations have the following main rights:

- *Access to financial support and incentives:* In the context of promoting an innovation-based growth model, the Philippines has stipulated that innovative organizations have full access to financial support programs and preferential

policies from the State. In Serbia, the Innovation Fund was established to provide financial resources for R&D activities and the commercialization of research results, thereby minimizing the capital barriers for startups and technology application projects. Spain also ensures access to public investment for innovative organizations, while applying tax incentives and infrastructure support policies. For France, in the context of the need to promote technology startups from institutes and universities, this country has issued preferential financial policies to encourage the formation of technology-based enterprises, promote linkages between the research sector and businesses, and support the development of technology-based startups.

- *Participate in the innovation ecosystem and be legally recognized:* Innovation organizations are entitled to participate in the national innovation ecosystem through official recognition mechanisms. Serbia requires innovative organizations to register in the National Register to enjoy benefits. The Philippines allows innovation organizations to be members of "Innovation Alliances", have legal status, and are the focal point for implementing tripartite cooperation: State - business - university/research institute. The French Republic allows universities and research institutes to establish business incubators that provide premises, equipment, and materials for technology startups to strongly encourage the formation of technology businesses from researchers and students, thereby closely linking institutes, schools, with businesses in the innovation ecosystem.

- *Use and connection of research infrastructure:* To promote innovation, Spain regulates the encouragement of expanding access to shared infrastructure among S&T organizations and innovation organizations, thereby reducing costs and increasing the efficiency of S&T and innovation activities. Similarly, France also allows public research institutions to grant external businesses or individuals to use their laboratories and scientific equipment for a limited period through cooperation contracts. This regulation creates conditions for the private sector to access the modern research infrastructure of the State to incubate new technologies, commercialize research results, promote innovation, and help optimize the use of public research resources.

In addition to ensuring their rights, innovation organizations must also fulfill legal obligations to ensure sustainable, effective development in harmony with the country's common goals on science, technology, and innovation. The main obligations include:

- *Compliance with national strategies and policies:* In the Philippines, to ensure that innovation efforts serve socio-economic development, avoid wasting resources, and focus on priorities, innovation organizations are required to link their activities with the National Innovation Strategy. In Serbia, innovation organizations must comply with regulations on intellectual property management, technical standards, and the responsibility to disclose information transparently.

France permits public-sector scientists to engage in commercial activities but requires compliance with the fundamental principles of public service, stemming from the tradition of valuing integrity in the public sector in France, ensuring a balance between promoting innovation and maintaining discipline.

- *Reporting and transparency of activities*: Serbia requires innovative organizations to periodically report on their activities (funding sources, results achieved, impact on technological innovation and society) to the Ministry of Science, Technological Development and Innovation or relevant agencies. The Philippines also has similar regulations, especially in state-funded programs. For France, transparency and accountability are highly valued in the 1999 Innovation and Research Law, which allows public sector scientists to participate in enterprises but requires them to comply with the fundamental principles of public service. Regulations on this obligation for innovation organizations in countries ensure that the activities of innovation organizations are always transparent, clear, and publicly accessible.

- *Contributing to the development of the ecosystem and training of human resources:* A common obligation of innovation organizations is to participate in building the national innovation ecosystem through cooperation with universities, research institutes, and enterprises. The Philippines requires innovative organizations to participate in human resource training and digital skills enhancement programs. Spain focuses on regulations on the obligation to disseminate an innovation culture in the community.

Table 2. Regulations on the rights and obligations of innovation organizations in some countries

Criteria for comparison	Philippines	Serbia	France	Spain
Rights of innovation organizations				
Access to finance, incentives	Funded by the National Innovation Council and national incentive programs	Enjoy support from the National Innovation Fund	Enjoy financial incentives, support for startup incubators	Enjoy tax incentives and public investment for innovation
Legal recognition and participation in the ecosystem	Recognized and participating in Innovation Clusters	Must be registered in the National Register to be recognized	Universities and institutes have the right to establish incubators on campus	Not specified
Using infrastructure	Not specified	Not specified	Allowing businesses to rent public research equipment	Encouraging S&T organizations and innovation organizations to use shared infrastructure
Obligations of innovation organizations				
Comply with national strategies and policies.	Align activities with the National Innovation Strategy.	Comply with regulations on intellectual property, technical standards	Comply with public service principles and public ethics	Not specified regulations

Reporting and transparency of activities	Periodic reporting on activities if receiving funding	Periodic reporting to management agencies	Not specified	Not specified
Contributing to ecosystem development and human resource training	Participating in digital skills training programs	Not specified	Not specified	Developing a culture of innovation in the community

Source: Compiled by the authors

Through analysis, it is evident that many countries place great emphasis on institutionalizing the rights and obligations of STI organizations in legal documents, considering this a foundation for promoting their central role within the innovation ecosystem. Alongside common regulations, some countries adopt specific provisions that reflect the diversity in approaches and governance of STI organizations across different national contexts.

2.3. Main policies for STI organizations

2.3.1. Science and technology organizations

- *Planning the system of science and technology organizations:* Current laws in many countries stipulate that science and technology organizations established with public budgets must be associated with the mission of serving the public interest and the national strategy on science and technology. Typically, China stipulates that science and technology organizations must comply with the orientation of public interest research, at the same time, play the role of knowledge dissemination institutions, connecting with society through expanding infrastructure and activities of science and technology dissemination. The Chinese government considers it necessary to orient science and technology organizations according to the national strategy to focus resources on development priorities and serve the common interest.

- *Autonomy of S&T organizations:* According to the Law on Independent Administrative Organizations (1999, amended in 2014) of Japan, national research institutes operate under a mechanism of financial and academic autonomy, while being strategically supervised by their governing ministries and performance-evaluated by the National Council for Science, Technology, and Innovation Policy. This model enables a balance between academic freedom and alignment with national objectives, especially for designated institutes that lead core technology. Japan's choice of a tightly supervised autonomy model stems from administrative reforms in the late 1990s and a centralized governance culture that values discipline and top-down orientation, allowing research units to innovate freely within a shared national framework of common goals.

- *Investment and finance:* China stipulates that the state budget prioritizes investment in public science and technology organizations; and plans a comprehensive system of national key laboratories, ensuring stable investment in

basic research, research for the public interest, and national security. China's maintenance of a large and stable public budget for public science and technology organizations reflects the view that science and technology are a key driving force for socio-economic development and focuses resources on long-term strategic goals.

Meanwhile, Korea stipulates the implementation of a research fund mechanism allocated based on output efficiency assessment, to coordinate investment and enhance accountability. This regulation of Korea was issued in the context of facing pressure to effectively use R&D resources to maintain growth momentum, both avoiding waste of resources and creating competitive incentives among R&D organizations.

- *Developing human resources for science and technology:* In France, in the context of implementing the strategy to promote the development of science and technology enterprises, enhance technology transfer and attract scientific talents to participate in domestic innovation, scientists have been allowed to start businesses, retain rights to research results and could be rotated between research institutes, universities and enterprises. China has regulations to encourage the formation of post-doctoral research stations at science and technology organizations to attract and train young doctors, creating additional resources for key fields. At the same time, regulations were introduced to reduce administrative procedures, aiming to free up time and unleash the creative potential of scientists. These adjustments occurred in the context of China's vigorous transformation to an innovation-driven economy, which necessitated a more favourable environment to nurture core innovation hubs.

- *Commercialization of research results and intellectual property (IP) management*: Korea regulates the granting of intellectual property exploitation rights to public S&T organizations, while creating a technology transfer mechanism through technology transfer offices (TTOs) and franchise contracts. This regulation is consistent with Korea's innovation culture, which focuses on the rapid practical application of S&T achievements to serve economic growth and technology export.

France allows research organizations to sign cooperation agreements with private or foreign enterprises to commercialize research results, facilitating the integration of science into the economic value chain. This French regulation stems from the need to improve the innovation performance of the economy and marks a change in France's legal culture, where intellectual property from public research is valued as an economic resource to be exploited.

- *Evaluation and ranking of S&T organizations:* China requires public S&T organizations to build an internal governance model with clear responsibilities, a scientific council, a competitive recruitment mechanism, and to be periodically monitored by an independent evaluation system. This model both encourages organizations to improve their internal capacity and is a tool to screen out weak organizations, suitable in the context of China, requiring S&T organizations to optimize resources and make practical contributions to national development goals.

The United States applies a self-assessment mechanism linked to budget responsibility. According to the Government Performance and Results Act of 1993 (amended in 2010) of the United States, public organizations, including S&T

organizations, must develop a 4-5-year strategic plan, identify policy goals, report annual implementation results, and demonstrate effective use of resources. This is an "evidence-based evaluation" model that helps to closely link public investment with real results in science and technology. This evaluation model of the United States is particularly important in the context of the Government being under pressure to increase accountability to taxpayers, thereby allocating the budget reasonably.

Table 3. Regulations on the main policies for developing science and technology organizations in some countries

Policy	China	Japan	Korea	France	United States
Planning	The public S&T organization system must serve the public interest and disseminate knowledge.	Not specified	The S&T organization system is linked to the national R&D program	The public organization system serves the public interest and supports the dissemination of S&T	Each organization must have a strategy consistent with national goals
Autonomy	Has a certain autonomy, subject to supervision from the internal assessment system	Financial and academic autonomy, subject to supervision by the National Science, Technology, and Innovation Policy Council	Has high autonomy, accountable to the State	Academic autonomy	High autonomy, supervised through budget responsibility and output efficiency
Investment, finance	The public budget invests heavily, prioritizing basic research and national security.	The State invests stably according to the medium-term plan	Allocation based on results, increasing accountability	The State invests in public research institutes	The budget is linked to strategic plans and actual results.
Human resource development	Science and Technology encourage post-doctoral stations, and reduce administrative procedures.	Regulations on human resource rotation policies	Regulations on talent support policies	Allow scientists to start businesses, retain patent rights	Regulations on training, attract talents policies.
Commercialize research results and IP management	Allow organizations to retain IP rights, promote technology transfer	Allow cooperation and commercialization, build an innovation ecosystem	Encourage and promote TTO and technology transfer	Promote IP exploitation, cooperate with private and foreign enterprises	Organizations have IP exploitation rights
Assessment and ranking	Evaluate output efficiency, have a scientific	Evaluate performance linked to	Evaluate output efficiency	Not specified	Evidence-based assessment, annual reports

	council, competition mechanism.	national strategic goals			

Source: Synthesis of the authors

2.3.2. Innovation Organization

The legal documents of each country have stipulated basic/main mechanisms and policies to support, promote, and regulate the activities of innovation organizations. These policies facilitate resources, IP, shape the legal environment, and operating mechanisms to ensure the central role of innovation organizations in the innovation ecosystem.

- *Preferential finance and credit:* The Philippines stipulates the establishment of an Innovation Fund to support organizations developing innovative products, processes, and services; at the same time, it requires commercial banks to allocate at least 4% of credit funds to innovation support activities. This regulation demonstrates the Philippines' efforts to fill the financial gap for startups and innovation organizations in the context that the commercial banking system has not really paid attention to high-risk activities such as innovation.

Serbia also regulates the establishment of an Innovation Activity Fund to support organizations conducting applied research and technology transfer; the fund also has the function of cooperating with international organizations to mobilize additional capital. Serbia's regulation is set in the context of the country's promotion of European integration and promotion of high-tech development, establishing the Innovation Fund as a tool to promote endogenous capacity while attracting international funding.

For France, the regulation on the mechanism of a common investment fund for innovation to invest capital in innovative enterprises reflects a balanced approach between the State and the market in innovation funding.

- *Ecosystem development and regional linkages:* The Philippines stipulates the development of a National Innovation Strategy, which places special emphasis on developing regional innovation alliances, interdisciplinary innovation centers, and business incubators; local governments are assigned the responsibility of developing innovation plans that are suitable for local characteristics and coordinate with regional innovation organizations.

Serbia stipulates the encouragement of the establishment of regional technology centers, connecting universities, research institutes with businesses, and identifies innovation organizations as key components of the regional innovation ecosystem.

France allows public universities and research institutes to establish business incubators to provide premises, equipment, and materials for start-ups or young technology companies. These policies contribute to closely linking institutes, universities with businesses, forming a sustainable inter-regional innovation network.

- *Intellectual property and technology transfer:* Serbia, with the transitional economy’s characteristics, where the State still plays a strict regulatory role and is

responsible for assets created from public resources, has therefore stipulated that if research products are created from public funding sources, the intellectual property rights belong to the State; and innovation organizations have the right to use and exploit those results.

The Philippines assigns the National Intellectual Property Office the task of supporting innovation organizations in registering, protecting, and commercializing inventions, utility solutions, and trademarks.

In France, the 1999 Law on Innovation and Research empowers public research institutions to take the initiative in commercializing their intellectual property, creating a corridor for scientists and private enterprises to access and apply inventions legally and conveniently.

- *Developing human resources and promoting innovation culture:* The Philippines regulates the development of STEM education and digital skills, and encourages cooperation between universities and innovation organizations to build practical innovation training programs.

Spain regulates that research and innovation organizations are responsible for disseminating scientific and technological knowledge to the community, especially to young people, thereby creating a foundation for an innovation culture and enhancing the spirit of scientific citizenship.

France regulates, focusing on promoting the spirit of entrepreneurship among researchers and students, allowing researchers, lecturers, engineers, and even young PhD graduates to participate in establishing companies to commercially exploit research results.

- *International cooperation and mobilizing global resources:* Spain regulates policies to encourage innovative organizations to cooperate with international partners; the State supports procedures, legal and financial aspects in the cooperation process.

France stipulates that research institutions are allowed to sign contracts to provide S&T services to foreign organizations and are entitled to use international arbitration to resolve disputes arising from cooperation contracts with foreign partners.

Table 4. Comparison of regulations on key policies for developing innovation organizations in some countries

Policy	Philippines	Serbia	France	Spain
Finance and preferential credit	Innovation Fund + requires banks to allocate 4% of credit to innovation	Innovation Activity Fund + mobilize capital through international cooperation	Joint investment fund to support innovative enterprises	Public investment, tax incentives for innovative organizations
Developing ecosystems	National strategy, regional innovation	Regional technology centers,	Incubators at institutes, universities, and	Developing local ecosystems,

and regional linkages	alliances, and regional innovative organizations	connecting institutes, universities, and enterprises in the region	supporting equipment for startups	regional research centers
IP and technology transfer	Support SMEs to register and commercialize IP	State-owned IP is publicly funded; Innovation organizations are allowed to use and exploit public research results.	Public schools and institutes proactively commercialize intellectual property.	Expand access to shared research infrastructure
Develop human resources and an innovation culture	STEM training, university-innovation organization cooperation	Training linked to the application, supporting young human resources	Encouraging lecturers and researchers to start businesses	Disseminate innovation culture to the community, especially to young people
International cooperation and resource mobilization	International cooperation is encouraged, with procedural support	International cooperation is encouraged to attract capital and technology	International contracts are signed, using international arbitration	Participating in EU programs, receiving legal support

Source: Compiled by the authors

Through studying the legal documents on science, technology, and innovation of several countries, all countries have established a comprehensive policy system to support and develop science, technology, and innovation organizations.

The notable similarity is that most countries have issued policies on planning the science and technology organization system in association with national strategies, expanding autonomy associated with efficiency assessment mechanisms, ensuring stable financial investment from the state budget, and encouraging the commercialization of research results. In addition, policies on human resource development, institute-university-enterprise linkage and international integration are also legalized to increase the connectivity and effectiveness of the innovation ecosystem.

However, each country has its own specific regulations, such as Japan applying a model of autonomy with strategic supervision for national research institutes; China focuses on planning a system of key laboratories and managing according to a performance model; France promotes entrepreneurship among public research teams, while the Philippines and Serbia set up innovation funds to provide financial support to innovation organizations. These characteristics reflect the flexibility in policy design to suit each country's institutions and development priorities.

3. Experience from studying the institutionalization of regulations on science, technology and innovation organizations in legal documents in some countries

International practice shows that science, technology and innovation organizations play a key role in the innovation ecosystem, and the contents related to science,

technology and innovation organizations are often regulated in legal documents on science, technology and innovation. In general, countries with developed science, technology and innovation have a system of science, technology and innovation organizations that are clearly and tightly regulated to promote science, technology and innovation activities.

Below are some typical experiences that many countries have applied, Vietnam can learn from and take as references to improve the institutions of science, technology and innovation organizations:

First, on the approach to law-making on science, technology, and innovation

Many countries, such as Japan, Korea and France, apply the framework law model, which only stipulates basic principles and policy orientations, while specific contents are designed and implemented through specialized laws. This is consistent with Vietnam's practice when it is necessary to separate the guiding law (framework law) and specialized laws for easy amendment and quick adaptation. The law will stipulate the principles, fundamental concepts, rights, and obligations, as well as the main policies of science, technology, and innovation organizations, and at the same time promulgate specialized laws to specifically regulate each separate group of policies.

Second, clearly define the content and classification of science and technology organizations and innovation organizations

Clearly defining the scope and types of science and technology organizations and innovation organizations in legal documents is one of the key factors for effective policy design. Countries such as Japan, Korea, France, and Serbia not only recognize public organizations but also expand the definition to include enterprises, private institutes, and non-profit organizations with S&T activities. Japan specifically defines national institutes, university centers, independent research institutes, or enterprises as S&T organizations. Serbia and the Philippines approach the identification of innovation organizations through their role in the innovation ecosystem, instead of a rigid legal definition.

Vietnam can refer to this to build an open concept of S&T organizations and innovation organizations in the Law on S&T, in line with the practice of combining public and private sectors and promoting flexibility in organization and operation.

Third, establish an autonomous mechanism with accountability.

Many countries have institutionalized a strong autonomous mechanism for S&T organizations, especially in deciding on research tasks to perform, organizational structure, finance, and domestic and international cooperation. However, this autonomy is always associated with the obligation to periodically report, evaluate effectiveness, and be financially transparent.

Japan allows research institutes to operate autonomously in terms of organization and budget, but must meet medium- and long-term goals and be supervised by the National Council for Science, Technology, and Innovation Policy. China requires public S&T organizations to have a modern management system, conduct periodic

evaluations, and accept social supervision. The United States requires public organizations to develop strategic plans and report on performance.

Vietnam should refer to the legalization of broader autonomy for S&T organizations, but at the same time, build a periodic assessment framework, ensuring transparency and efficiency of public investment in S&T organizations.

Fourth, legalize financial mechanisms and funds to support S&T organizations and innovation organizations.

Ensuring stable financial resources is a prerequisite for the sustainable development of S&T organizations and innovation organizations. Countries such as China identify the state budget as a key resource to ensure sustainable development for basic research organizations and key laboratories. Serbia and the Philippines have both established Innovation Funds to finance research, product development and technology transfer activities. France has developed investment fund mechanisms for innovative enterprises.

Fifth, promote the commercialization of research results through the legal framework.

The laws of all countries emphasize the role of commercializing research results as a key function of S&T organizations and innovation organizations. France and South Korea allow public S&T organizations to retain ownership or exploit intellectual property created by themselves, and to encourage the signing of cooperation contracts with domestic and foreign enterprises. Models such as technology transfer offices (TTOs), incubator centers, and benefit-sharing mechanisms with researchers are all legalized. Serbia and the Philippines also clearly stipulate the obligation to support innovation organizations in the commercialization of inventions and technology transfer.

Vietnam can learn from and refer to these experiences to institutionalize regulation on ownership and exploitation of intellectual property for research results carried out by S&T organizations using the state budget; at the same time, institutionalize the model of technology transfer organizations, support startups, and cooperation mechanisms between institutes, schools, and enterprises.

Sixth, linking S&T organizations and innovation organizations with network planning, decentralization, and international cooperation

In developed countries, public S&T organizations are planned according to national strategic orientations, with clear decentralization but still coordinated uniformly. China stipulates that public S&T organizations must serve national strategies and be evaluated and rearranged based on operational efficiency. Japan is highly decentralized but still periodically evaluated by the Central Agency (CSTI). The laws also encourage international cooperation, allowing domestic S&T organizations to cooperate, associate, and even establish joint ventures with foreign partners.

Vietnam should refer to this experience to institutionalize regulations on the periodic evaluation system, while expanding the legal corridor for international cooperation in research and innovation.

Seventh, encourage the mobility of S&T and innovation human resources between the public and private sectors

One of the key factors of S&T organizations and innovation organizations is human resources. Countries have legalized the rights, start-up mechanisms and rotation of S&T and innovation human resources to maximize innovative capacity. France allows researchers in public S&T organizations to establish enterprises, exploit intellectual property and rotate between research institutes, enterprises, and universities. The Philippines requires innovative organizations to participate in training and the dissemination of technological skills.

Vietnam can refer to this to encourage the rotation of human resources between the public and private sectors, promote S&T and innovation organizations to participate in training and disseminate S&T and innovation knowledge to the community.

4. Conclusion

Completing the legal framework for S&T and innovation organizations is a key step to developing the innovation ecosystem in Vietnam. Through analyzing international experience, it shows the importance of a framework law approach, flexible classification of S&T organizations and innovation organizations, granting autonomy associated with responsibility and transparent assessment.

These suggestions contribute to orienting the process of perfecting the institutional framework for S&T and innovation in general, and S&T and innovation organizations in particular in Vietnam, contributing to improving the quality of S&T and innovation organizations in contributing to the socio-economic development of the country./.

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