

Relationship between state, market and society in management and development of science and technology in Vietnam

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Abstract: During more than 35 years of implementing the renovation policy, our Party has always researched, tested, and applied industrialization models and strategies suitable to the country's reality. The mid-term National Delegates Conference of the 7th Party Congress (1994) put forward the viewpoint that industrialization and modernization is a process of fundamental and comprehensive transformation of production, business, service and economic and social management activities from mainly using manual labor to widely using labor based on technology, creating high social labor productivity with the motto "Industrialization must go hand in hand with modernization..., forming spearheads of economic development according to the advanced level of world science and technology". Document XII of the Party (2016) emphasized: "Strongly develop science and technology, make science and technology truly the top national policy, the most important driving force for the development of modern productive forces and knowledge-based economy". And most recently, Document XIII of the Party (2021) has shaped the development of science and technology in the direction of: (1) Accelerating the transition from dependent industrial development to innovative creative industry, proactively mastering basic technology in Vietnam; (2) Strongly transforming the industrial economy into a digital economy, based on a knowledge foundation; (3) Breakthrough innovation based on a digital economy. Therefore, determining the legal framework of the State, the "interest" relationship brought by the market and the supervision of the social community is very necessary in the management and development of science and technology today. However, the relationship between the three institutions of the state, the market and society in science and technology development still has many shortcomings that need to be addressed and resolved in conjunction with the goal of developing a green economy, a circular economy, inclusive growth, and rapid and sustainable economic development based on the Fourth Industrial Revolution with digital technology, artificial intelligence, the Internet of Things and big data... which has been and is profoundly changing the global production and economy towards a smarter, more efficient direction with an unprecedentedly fast growth rate.

Keywords: Market, Science and technology, Society, State.

1. The Relationship Between the State, The Market and Society in the Management and Development of Science and Technology

1.1. Concepts And Characteristics of Science and Technology

Pier Auger (American researcher) introduced the concept of science: "Science is a system of knowledge about all kinds of laws of matter and the movement of matter, the laws of nature, society and

thinking" (Pier Auger, 1960)¹. This definition is used by UNESCO (United Nations Educational Scientific and Cultural Organization) in official documents and is also generally recognized in the research community around the world. At the same time, scientist Price Derek identified science as a social institution: "Science may be the most significant social institution in modern society. That institution is transforming the lives and destinies of people in this world more than any political or religious event"².

For Vietnam, the term science is defined in Clause 1, Article 3 of the Law on Science and Technology (amended and supplemented) in 2018: "Science is a system of knowledge about the nature, laws of existence and development of things, natural phenomena, society and thinking" and is specified in sub-law documents (decisions, circulars, etc.) to regulate scientific research activities. On the other hand, technology is the result of the process of applying scientific achievements to production, is the product of human creative intellectual activities in the field of production (or a combination of many stages of the process of applying scientific knowledge to production to create goods and services to serve people). Therefore, the Law on Science and Technology (amended and supplemented) 2018 in Clause 2, Article 1 provides an understanding of technology: "Technology is a solution, process, technical know-how with or without tools and means used to transform resources into products", or in other words, technology is a collection of knowledge, skills, tools, and means used to transform production resources into goods and services for a certain purpose. Therefore, in the management and development of science and technology, it is necessary to grasp the characteristics in order to establish the relationship between the State, the market and society, which are:

Firstly, investing in science and technology requires large capital and is highly risky, but if the research is successful, it will create a breakthrough for development (Sometimes out of 10 studies, only 1 is successful, so this needs to be accepted in scientific research).

Second, science and technology products and services are often difficult to measure directly by market prices, but must go through intermediary institutions such as organizations, associations, businesses... in pricing, tracing source technology, providing legal advice on buying and selling, and implementing the technology transfer process.

Third, assets formed from intellectual property are intangible assets, and it is difficult to quantify the value of assets to contribute capital to the development of science and technology enterprises, such as mortgages at banks when borrowing capital, so very specific institutions and mechanisms are needed, including mechanisms for evaluating, protecting assets, lending capital, etc., as well as establishing a specific bank for science and technology development.

Fourth, the science and technology market always develops after other goods and services markets, always requiring the state's role in creating development, including market creation, from the public sector market to the private sector market. For example, the state invests in developing the defense industry in a dual-use direction, initially for defense purposes, then transferred to civilians.

Fifth, intellectual property is easily stolen, copyrights are lost, etc., so protecting intellectual property rights for scientists requires social organizations of intellectuals; ensuring that scientists participate in professional criticism requires fully promoting the role of professional associations; public opinion protecting the rights of scientists is also understood as society.

Sixth, research universities need to increase their autonomy, which is essentially a space for intellectual activity - not a career unit, nor an administrative area, but a social space for knowledge.

Seventh, the management model for science and technology development is very diverse: There are science and technology enterprises in state research institutes; there are research institutes in state enterprises or private enterprises; there are research institutes in schools; there are science and technology enterprises in schools...

Pier Auger. Tendances actuelles de la recherche scientifique, Unesco, Paris, 1961, tr17-19¹
Price Derek J (1976), The Nature of Science, by Goldsby New York: Harper&Row, PP1-28²

Therefore, the management and development of science and technology must be associated with very specific factors and characteristics of science and technology, which are: 1) Individual scientists with freedom of thought, academic freedom, the right to protect inventions and patents, the right to enjoy intellectual achievements; 2) Association of knowledge to protect copyright, intellectual property, property rights; (3) University autonomy (according to the non-profit principle) so that this place can truly become a space for knowledge research and creation; 4) Social organizations authorized by the state to evaluate, train human resources, issue certificates to evaluate the quality of science and technology products by sector, region...

1.2. The Relationship Between the State, the Market And Society in the Management and Development of Science and Technology

1.2.1. The Role of the State in the Management and Development of Science and Technology

The State is the governing entity established in Article 2 of the 2013 Constitution. The State governs the socio-economy through laws, planning, plans, policies and regulatory tools on the basis of respecting the objective laws of the market and society, specifically:

Table 1.

State, market and society in science and technology management and development.

	Manage	Develop
State	- Promulgating laws, institutions, policies and using tools in science and technology management	- Developing high-quality human resources for science and technology in the spirit of "breakthrough" in Documents XI, XII, XIII
	- Develop strategic programs and plans for science and technology development	- Formation and development of science and technology organizations
	- Management by coordination between functional agencies in science and technology management	- Develop and mobilize financial resources for scientific research and technology development
	- Establish functional agencies associated with the state apparatus, create a coordination (operational) mechanism between departments in science and technology management.	- Developing infrastructure for scientific research and technological development
	- Building a process for managing scientific research and technology application	- Developing a science and technology innovation startup ecosystem (Cooperation programs, projects to support national research and innovation...)
	Management and development of science and technology market	
	- Creating scale and types of markets (Innovation startup ecosystem market, technology trading market, technology transfer market, etc.)	
	- Modernizing the science and technology market with digital technology, networking, linkage and information transparency	
	- Establish a trading floor for buying and selling science and technology products, intermediary in buying and selling, consulting and transferring technology	
	- Modernizing digital technology in science and technology market management in providing legal documents and policy advice	
Management and development of science and technology associated with social foundation		
- Encourage social organizations (Classes, communities, social groups...) and non-social organizations (social institutions, social values...) to access S&T values to enhance the		

connection of social entities
- Developing social values based on the foundation of science and technology development towards information transparency, connecting social organizations and balancing the interests of participating social entities
- Encourage the digitization of social values and norms to create channels to attract and connect communities in society

- *The State orients, builds and perfects economic institutions:* (1) The State orients and guides the movement and development of the entire economy using tools such as strategies, planning, policies, plans, information and State resources; (2) The State as a representative of the ownership of the entire people (Article 53 of the 2013 Constitution), therefore, in establishing property ownership rights, they must be legalized by legal and sub-law documents to establish the "power" of subjects when participating in scientific and technological activities; (3) Building a stable legal system, suitable for the market economy and the scientific and technological revolution, strictly enforcing the law, creating a legal and cultural environment for all citizens and all organizations in society.
- *The State "identifies" and creates a synchronous science and technology market:* In the management of science and technology, the state is required to establish rights in terms (legal regulations) to "identify" types of assets in a public and transparent manner such as intellectual products, technological innovations, scientific copyrights, technological solutions, etc.; at the same time, synchronously create a science and technology market (buying and selling market, trading floor, national data system, system of science and technology service organizations, etc.) from appropriate mechanisms and policies to promote trade in science and technology products.
- *Organize implementation, ensure that business entities and social organizations operate in accordance with the law in science and technology (the State performs the function of creation):* According to the report of Document XIII³, continue to restructure the economy associated with transforming the growth model. The State continues to arrange and reorganize industries, fields, and important economic regions in a modern direction, prioritizing technology factors in connection (network, digitalization, artificial intelligence connection...), including arranging and consolidating corporations, state-owned corporations, state-owned enterprises, organizing industrial parks, export processing zones... in the direction of modern governance, smart planning associated with a connected ecosystem. The State ensures the major balances of the market economy based on technological factors, information connection and transparency in the processing such as total supply - total demand balance, export - import balance, budget revenue - expenditure balance, ensuring macroeconomic stability of the market economy. The State protects and safeguards (intellectual property rights, inventions, patents...) for business entities and social organizations in accordance with the law, provides information and promptly handles.
- *The State monitors and handles violations of entities (enterprises or social organizations) participating in the purchase, sale and transfer of science and technology in the market:* The State uses "judicial" power to protect the socialist legal system, protect the socialist regime and the people's right to mastery, protect the property of the State, of the collective, protect the life, property, freedom, honor and dignity of citizens. In the context of increasingly high development of science and technology, acts of infringement of intellectual property rights (patents, inventions, technological secrets, technical features, designs, trademarks...) in the purchase, sale and transfer of technology. Therefore, the work of inspection, control and handling of violations must be strictly handled and in accordance with the provisions of law to ensure the right to creativity, interests and motivation

Central Executive Committee (2021), *Documents of the 13th National Congress of the Party*, National Political Publishing House Truth³

of entities when participating in the science and technology market, production and business activities and responsibility to society.

1.2.2. The Role of the Market in the Development of Science and Technology

The market here is not a "spontaneous" market, but a market that is oriented and managed according to its own orbit (respecting the rules), based on the movement of objective laws (laws of value, laws of supply and demand, laws of competition...), operating mechanisms (self-regulating and allocating mechanisms according to price signals) to ensure that institutions and policies are not biased (taking advantage of mechanisms and policies), allocating resources without profit (not rudely interfering in allocation), without privileges and special interests (creating personal interests, group interests) from the operation and management of the State.

- The market is a channel for providing information to avoid the imposition of "subjective" and "monopolistic" will from the State in planning strategies and programs for science and technology development in industries and fields; at the same time, overcoming "mixed" functions, "confused" functions, and "disordered" functions of the State is a very basic requirement in defining the apparatus, functions, and resources for managing and developing science and technology associated with the process of transforming the growth model as "...effectively combining breadth with depth, focusing on depth, improving growth quality and competitiveness..." and "...developing science and technology"⁴ as a breakthrough in development.
- The market is the place (space and time) to "re-evaluate" the scientific and technological values invented and created by enterprises, social organizations, even according to the State's ordering criteria in the S&T development program to serve the national interest and the people's interests. It can be said that the market is the "measure" and "bridge" for scientific research results to be bought, sold and transferred; at the same time, it also affirms the value of socially accepted scientific and technological products (from enterprises and social organizations) as the driving force for promoting scientific research and technological development in the coming time.
- The market is a "feedback" channel in orienting and guiding, building and perfecting institutions, establishing mechanisms, policies and tools to serve socio-economic development, especially in areas related to science and technology development. It is the market that has guided the State in planning, formulating plans and developing solutions to attract businesses and social organizations to participate in "investing" capital in scientific research, technology application, etc.
- The market is a "playground" for the State and social organizations to freely create from scientific ideas, scientific and technological products based on its inherent functions such as: (1) The function of recognition (rejection), that is, the scientific and technological products produced can withstand the "examination" (selection) and "voting" of customers in terms of both quantity and quality of products, meaning they are recognized; (2) The function of implementation, which is the place to carry out the buying and selling of scientific and technological products that buyers and sellers acknowledge (feel satisfied); at the same time, it leads to the effective allocation of scientific and technological potential (human resources, infrastructure and finance); (3) The function of information and regulation, through the market (information) to regulate the plan for allocating scientific resources, transferring and applying technology to effective industries and fields (governed by the law of profit rate).

1.2.3. The Role of Society in the Development of Science and Technology

Society and social organizations are both a social foundation of the State, an institution to protect and promote the legitimate and legal rights of members of society, and customers of businesses participating in the market. The motivation of organizations in society is social values and legitimate

Communist Party of Vietnam (2011), *Documents of the 11th National Congress of Delegates*, National Political Publishing House, pp.30-32⁴

interests for "classes", communities, and social groups that are very diverse, and sometimes local interests conflict with the interests of the whole society, and the interests of one social group conflict with the interests of another social group.

- A healthy social development, harmonious relationships, and stable purchasing power are important indicators measuring information about the social foundation of a strong State and a potential market. In particular, the potential for science and technology development is gradually changing the "nuances", behaviors and attitudes of society, affecting the interests and methods of community activities and having a great impact on the perception and management of the economy. Correctly recognizing the role of technology is changing cultural values, customs, community lifestyles... to have orientation, management and selection of technology suitable to the values of the community. Encourage the development of technology products, increase the ability to connect the community and promote all resources in the social community according to the objective trends of the market and integration.
- Strengthening social autonomy with contents that people do not authorize to the state, but are regulated in laws, regulations and social conventions. Self-governing values must create motivation for social development, the responsibility of participants (classes, communities and social groups) based on technology and digital technology to guide the community to promote traditional values, humanistic values, etc. To avoid "self-governing" becoming "spontaneous", the State must make adjustments in orientation and management according to the "rule of law" State method that respects the law, respects participating subjects and respects the creativity of organizations in the community to create motivation and benefits for participating parties.
 - Society is the area where science and technology are realized from the creativity of participating subjects, which is the creativity in State governance by technology, the pursuit of technological innovation by enterprises and the value of scientific and technological products recognized in the market. Society is the counterbalancing institution, testing the effectiveness of technological values, the effectiveness of using technology in state agencies interacting with social management to avoid waste in public investment related to science and technology development, orienting the right industries and technological fields that need to be developed and creating an environment for market (enterprises) to participate.

2. The Current Status of the Relationship Between the State, the Market and Society in the Management and Development of Science and Technology

Basically, the theoretical orientations have gradually established a cognitive framework to shape the relationship between the State, the market and society as well as determine the role of the subjects when participating in the management and development of science and technology. The development of theoretical orientations always goes hand in hand with summarizing and evaluating the practical relationships according to the following contents:

- *"Minimize" State intervention and expand market and social participation, strengthen science and technology management within the legal framework*

The State "reduces" administrative intervention, command and voluntarism from the State subject to the management mechanism by law, orientation, guidance and environment creation, along with the construction of institutions and legal framework for the operation of the market and social participation in the management and development of science and technology is an inevitable, objective trend and consistent with the national development goals and universal standards at the international level. Relations in "controlling" the game by promulgating legal basis (laws and sub-law documents), regulating social relations in the field of science and technology to clearly define the scope and form of activities as well as the rights, responsibilities and obligations of the State and participating entities such as promulgating the Law on Science and Technology No. 29/2013/QH13 dated June 18, 2013, including 11 chapters and 81 articles (or the Law on Science and Technology 2013), regulating

organizations and individuals participating in science and technology activities (specified by Decree No. 08/2014/NĐ-CP of the Prime Minister dated January 27, 2014); Law No. 28/2018/QH14 dated June 16, 2018 of the National Assembly amending and supplementing a number of articles of 11 laws related to planning (or the Law on Science and Technology amended and supplemented in 2018); Circular No. 12/2009/TT-BKHHCN dated May 8, 2009, guiding the assessment and acceptance of science and technology topics and state-level experimental production projects (replacing Decision No. 13/2004/QĐ-BKHHCN dated May 15, 2004 and Decision No. 04/2007/QĐ-BKHHCN dated March 19, 2007 of the Minister of Science and Technology); Circular No. 06/2012/TT-BKHHCN dated March 12, 2012, guiding the determination of science and technology tasks under key science and technology programs at the state level; Circular No. 07/2014/TT-BKHHCN dated May 26, 2014, regulating the order and procedures for determining national-level science and technology tasks using the state budget (replacing Circular No. 06/2012/TT-BKHHCN dated March 12, 2012 of the Ministry of Science and Technology); Circular No. 10/2014/TT-BKHHCN dated May 30, 2014, regulating the selection and direct assignment of organizations and individuals to perform national-level science and technology tasks using the state budget (replacing Circular No. 08/2012/TT-BKHHCN dated April 2, 2012 and Circular No. 09/2012/TT-BKHHCN dated April 2, 2012); Circular No. 11/2013/TT-BKHHCN dated March 29, 2013, guiding the management of science and technology projects (replacing the Provisional Regulations on the development and management of science and technology projects issued together with Decision No. 11/2005/QĐ-BKHHCN and Circular No. 17/2010/TT-BKHHCN); Circular No. 12/2013/TT-BKHHCN dated March 29, 2013, guiding the review, appraisal and approval of science and technology projects to develop national products; Joint Circular No. 44/2007/TTLT-BTC-BKHHCN, guiding the construction norms and allocation of budget estimates for science and technology topics and projects using the State budget (replacing Joint Circular No. 45/2001/TTLT/BTC-BKHHCNMT dated June 18, 2001); Circular No. 50/2014/TT-BCT dated December 15, 2014 regulating the management of science and technology tasks of the Ministry of Industry and Trade; In particular, Decision No. 569/QĐ-Tgg dated May 11, 2022 of the Prime Minister "Issuing the Strategy for Science, Technology and Innovation Development to 2030" demonstrates the viewpoints, goals and directions for science and technology development, requiring all levels and sectors to unify and work together towards a science and technology ecosystem that develops in association with innovation.

In addition, if the State wants to dominate the game, it must "identify" (establish) property rights for social entities to clearly define property rights when participating in the science and technology market, such as the Land Law promulgated in 1993 (amended in 2013), the Law on Science and Technology 2013 (amended in 2018), Decree 29/2018/NĐ-CP dated March 5, 2018 on establishing property rights to determine the value of purchased assets... In particular, realizing the profound impact of intellectual property on socio-economic development, the National Assembly promulgated the Intellectual property Law in 2005 (Law No. 50/2005/QH11), regulating copyright, rights related to copyright, industrial property rights,... and the 12th National Assembly continued to amend and supplement a number of articles (Law No. 36/2009/QH12). In order to promptly meet policy requirements within the framework of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership, on June 14, 2019, the 14th National Assembly, 7th session, passed the Law amending and supplementing a number of articles of the Law on Insurance Business, the Law on Intellectual Property (Law No. 42/2019/QH14) and many other Codes and laws have also been issued with provisions related to intellectual property. At the same time, the State has paid special attention to perfecting (completing) the supporting legal basis, creating mechanisms and rules of the game to develop the science and technology market in the face of the "pressure" (objective needs) of society in the management and development of science and technology, specifically: The Prime Minister issued Decision 2075/QĐ-TTg dated November 8, 2013 approving the Science and Technology Market Development Program until 2020 to ensure close adherence to the main objectives: (i) Increase the value of transactions buying and

selling science and technology products and services on the market; (ii) Increase the proportion of transactions buying and selling intellectual property such as solutions, processes, technical know-how; (iii) Establish a network of accompanying technology trading floors (such as a system of supporting science and technology service organizations, focusing on Hanoi, Ho Chi Minh City and Da Nang).

In particular, by the end of 2023, the Party, the National Assembly, the Government, the Prime Minister, and ministries have issued a number of outstanding documents related to the fields of science, technology and innovation, specifically:

- Resolution on the development and application of biotechnology to serve the country's sustainable development in the new situation (No. 36-NQ/TW dated November 30, 2023 of the Politburo);
- Resolution on continuing to build and promote the role of the intellectual team to meet the requirements of rapid and sustainable national development in the new period (No. 45-NQ/TW dated November 24, 2023 of the Politburo);
- Resolution on inclusive, fast and sustainable development based mainly on science, technology and innovation, focusing on Resolution No. 81/2023/QH15 on "National Master Plan for the period 2021-2030, vision to 2050" affirms the development perspective in the period 2021-2023 is inclusive, fast and sustainable development based mainly on science, technology and innovation, digital transformation, green transformation and circular economic development;
- Detailed regulations on a number of articles and measures to implement the Law on Intellectual Property, specifically: Decree 17/2023/NĐ-CP dated April 26, 2023 of the Government regulating copyright and related rights; Decree 65/2023/NĐ-CP dated August 23, 2023 of the Government regulating industrial property, protection of industrial property rights, rights to plants and state management of intellectual property; Decree 79/2023/NĐ-CP dated November 15, 2023 clearly regulating rights to plants... to specify the Law amending and supplementing a number of articles of the Law on Intellectual Property passed by the National Assembly on June 16, 2022.
- Issue Decrees to unify the management of innovation activities, specifically: Decree No. 28/2023/NĐ-CP dated June 2, 2023 of the Government stipulating the functions, tasks, powers and organizational structure of the Ministry of Science and Technology;
- Directive No. 25/CT-TTg dated October 5, 2023 of the Prime Minister on synchronous, effective, modern and integrated development of science and technology affirms that, up to now, the science and technology market has gradually formed, developed and achieved some remarkable results;
- The Ministry of Finance issued Circular 03/2023/TT-BTC dated January 10, 2023 regulating the preparation of estimates, management and use and settlement of state budget funds for the implementation of science and technology tasks. The Minister of Science and Technology issued Circular 02/2023/TT-BKHCHN dated May 8, 2023 guiding a number of specialized contents serving the work of preparing estimates for the implementation of science and technology tasks using the state budget (Circular 02). The above two Circulars have new provisions compared to Joint Circular No. 55/2015/TTLT/BTC-BKHCHN (Circular No. 55) to remove some shortcomings and difficulties in current regulations on the work of estimating budgets for science and technology tasks.

According to the Report of the National Office of Intellectual Property (2020), the number of industrial property copyright registrations reached 76,072 applications, an increase of 1.7% over the same period in 2019 (of which, patent applications increased by 3.8%, national trademark applications increased by 4.3%, especially geographical indication applications reached the highest level ever). In general, Vietnam belongs to the group with low international intellectual property index and ranking,

in 2020, Vietnam ranked 42/53 countries considered, while ranked 12/15 in Asia (above Thailand, Indonesia and Pakistan), compared to 2019, the ranking has improved Table 2.

Table 2.
Rankings of Viet Nam (2018-2020).

	GII	Innovation inputs	Innovation outputs
2020	42	62	38
2019	42	63	37
2018	45	65	41

Note: * Among the 131 economies included in the GII 2020 Report, Vietnam ranks 42nd.
* Among the 29 lower-middle-income economies included in the GII 2020 Report, Vietnam ranks 1st.
* Among the 17 economies in Southeast Asia, East Asia and Oceania included in the GII 2020 Report, Vietnam ranks 9th.

Source: Global innovation policy center, 2020 [18].

However, Vietnam ranked 44th out of 123 countries participating in the 2021 Global Innovation Index survey, while Vietnam is one of four middle-income countries/economies assessed by World Intellectual Property Organization as catching up with the growth momentum of the world innovation index. Table 3.

Table 3.
Global innovation index ranking năm 2021.

Rank	Country/Economy	Score	Rank within income group	Rank region
1	Switzerland	65.5	1	1
2	Sweden	63.1	2	2
3	United States	61.3	3	1
4	United Kingdom	59.8	4	3
5	South Korea	59.3	5	1
6	Netherlands	58.6	6	4
7	Finland	58.4	7	5
8	Singapore	57.8	8	2
9	Denmark	57.3	9	6
10	Germany	67.3	10	7
44	Vietnam	37.0	1	10

Source: World intellectual property organization, 2021) [19]

That affirms that Vietnam is integrating and participating quite fully in international agreements and treaties related to the science and technology market such as: Joining the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) of the WTO in January 2007; Berne Convention for the Protection of Literary, Artistic and Scientific Works; Rome Convention for the Protection of Performers and Producers of Phonograms against Illegal Duplication...

Along with establishing a legal basis, "identifying" intellectual property rights and creating a science and technology market, the State organizes implementation, ensuring that business entities and social organizations operate science and technology in accordance with the law, specifically: In the period of 2016 - 2020, on average, each year there are about 126.5 thousand newly established enterprises with the average registered capital per enterprise increasing by more than 1.8 times compared to 2015, many creative models based on science, technology and innovation have been formed (especially information technology) and private economic groups based on technology platforms (especially science and technology enterprises) (as of December 30, 2016, the State invested in building

17 key laboratories in priority technology fields, 3 high-tech industrial parks in 3 regions, 12 high-tech agricultural zones and deploying more than 500 IT applications at the central and local levels)⁵. According to the Report of the Department of Market Development and Science and Technology Enterprises (2020), after Decree No. 13/2019/NĐ-CP took effect, the number of innovative startups registered and granted Science and Technology Enterprise Certificates tended to increase rapidly (as of December 2020, the whole country had 538 enterprises granted Science and Technology Enterprise Certificates), forming a number of large economic groups applying modern science and technology to manufacturing technology, especially the automobile industry (such as Vingroup, Thanh Cong Group...)⁶ has raised global competitiveness from 58th in 2009 to 42nd in 2019. In particular, cities such as Ho Chi Minh City and Hanoi focus on building and developing an innovative startup ecosystem, strengthening the implementation of communication activities, introducing policies and supporting innovative startups... However, in general, the number of Science and Technology Enterprises granted In 2020, the number of enterprises decreased compared to 2019 due to the impact of the Covid19 epidemic, but there was still a boom in business based on the value of technology and innovation, specifically: according to the Report of 235/538 enterprises providing information, 31,264 thousand workers were created, revenue reached 147,170 trillion VND, of which 217 enterprises had revenue from science and technology products with a total of 24,123 trillion VND.

And finally, in ensuring that in the research, application and transfer of science and technology, the State plays a role in supervising and handling violations of entities participating in the purchase and transfer of science and technology in the market, specifically: Implementing Circular 04/2014/TT-BKHHCN dated April 8, 2014 of the Ministry of Science and Technology guiding the assessment of production technology level in transfer; In 2015, issuing Circular No. 23/2015/TT-BKHHCN dated November 13, 2015 of the Ministry of Science and Technology regulating the import of used machinery, equipment and technological lines to strengthen technology management, prevent the import of outdated technological equipment (equipment age not exceeding 10 years) in accordance with National Technical Regulations or National Standards or G7 standards on safety, energy saving and environment. Completing the Law on Technology Transfer 2006 (amended and supplemented in 2016) to complete the system of legal documents to ensure the purchase, sale and transfer of science and technology in accordance with the economic and social development situation and market demand (integration).

- *The market overcomes the "limits" of the State, provides information and encourages social actors to participate.*

The market overcomes the "limitations" from the State (such as resource allocation lacking information, investing only in essential projects due to lack of resources, overlapping functions due to lack of monitoring mechanisms...) related to scientific research, technology deployment and application. In fact, the State is "limited" (restricted) in providing funding for scientific and technological research, because it depends heavily on the efficiency of production and business activities, tax revenue and management organization, mobilization mechanism from the market and participating economic sectors. According to calculations by the General Statistics Office (2022), the average state budget expenditure for science and technology in the past 10 years (2011-2022) has only reached 8,276 trillion (accounting for about 0.7%), specifically:

Table 4.
Science and technology career expenditure for the period 2011-2021.

	2011	2013	2015	2016	2017	2018	2019	2020	2021
Billion VND	5.758	6.593	9.392	9.440	9.256	12.310	12.955	11.039	13.443
Structure (%)	0.73	0.61	0.74	0.73	0.68	0.76	0.74	0.73	0.79

Ministry of Science and Technology (2016), Vietnam Science and Technology 2015, Science and Technology Publishing House⁵
World Economic Forum (2019), Global Competitiveness Report 2019, UNIDO⁶

Source: General Statistics Office, 2022

Meanwhile, the revenue from the market and society is very large, on average, there are nearly 100,000 enterprises established (started) every year with an average capital of 18 billion VND/1 enterprise (calculated for existing enterprises), equivalent to 1,800 trillion VND in 2019 (the state budget only accounts for 0.6%). Therefore, implementing the Project "Restructuring the science and technology sector to 2020, with a vision to 2030 associated with transforming the growth model to contribute to economic development", especially focusing on developing the science and technology market is a solution to promote science and technology development. The Prime Minister has approved the Program for developing the science and technology market to 2020 under Decision No. 2075/2013/QĐ-TTg dated November 8, 2013 (referred to as Program 2075) to gradually develop and perfect the science and technology market. After more than 7 years of implementation, the 2075 Program has approved 63 tasks out of 500 registered proposals with a total budget of 340 billion VND, of which 194 billion VND is from the State budget (55%), the rest is from participating enterprises, specifically: (i) more than 25 products have been registered for intellectual property rights (2016 - 2020 period); (ii) more than 1,200 contracts have been signed with a value of nearly 1,000 billion VND (2015 - 2018 period); (iii) 1,000 supply-demand connection sessions and investment connection sessions have been organized for more than 5,000 organizations (2016 - 2018 period); (iv) over 120 training courses have been conducted with 3,000 people trained (2015 - 2020 period); (v) Conducted 8 delegations abroad, cooperating with the Netherlands, Switzerland, France, Singapore, Japan, China, Laos...

- *Socialization of organizations, individuals, scientific and technological values through legal framework and market institutions*

Socialization in science and technology development is gradually being realized through programs (2075), organizing major annual events (such as Technology and Equipment Market - Techmart, Connecting Technology Supply and Demand - Techdemo, Startup Festival - Techfest...)... creating a great influence in the participating community (enterprises, organizations, inventors), specifically:

(1) The 2015 International Techmart event in Hanoi attracted 753 participants, including 500 enterprises, 110 research institutes, 22 universities, 32 departments of science and technology, 32 organizations supporting science development and technology transfer, and 57 non-professional inventors. At the event, 463 contracts and memorandums of understanding were signed and thousands of transactions were made to buy and sell technology, equipment, and products with a total value of more than 500 billion VND. Many specialized seminars were organized to introduce new technologies closer to enterprises, creating a two-way connection environment between enterprises and research institutes and universities.

(2) The Techdemo event in 2015 in Ba Ria - Vung Tau gathered 250 technological processes, equipment, products and research results of 98 domestic and international enterprises and organizations, attracting nearly 1,000 delegates from state management agencies on science and technology, research institutes, universities, inventors, domestic and international enterprises. The event connected 62 meetings between the supply and demand sides of technology, signed 12 technology transfer cooperation contracts with a total value of more than 63 billion VND, typically the technology transfer contract between Fitohocmon Biotechnology Joint Stock Company and Bong Trang Agricultural - Service Cooperative, Southern Institute of Agricultural Science and Technology and Tung Lam Alcohol Production Factory Company Limited.

(3) Techfest 2016 event in Hanoi, international scale with more than 100 booths of startups, startup support organizations introducing outstanding products and services in the fields of education, agriculture, banking technology/e-commerce/mobile/management technology, games/entertainment/media and future technology, domestic and foreign investment funds (Cyberagent Ventures, 500 startups Vietnam, Perspective Ventures, Innotech Asia Capital,). There were 120 connections between investors and startups, successfully organized a contest to search for

startup talent and find outstanding startup groups. The series of domestic and international seminars created a forum to share startup experiences, policy making experiences between startups, international experts, policy makers, investment funds, universities; Most recently, Techfest Vietnam 2019 was held in Quang Ninh, attracting the attention of more than 700 startups from the competition of technology villages. With over 250 connections between startups with investment interest reaching nearly 14 million USD. The results achieved from Techfest 2019 have shown the development of Vietnam's innovative startup ecosystem, gradually integrating with the international community.

2.1. Typical Research through Some Models of Science and Technology Development in Vietnam

2.1.1. The Case of Viettel Group (State-Owned Enterprise, Military)

The Military Telecommunications Group (Viettel) is a state-owned enterprise (SOE) operating in the telecommunications sector. In addition to its production and business tasks, the Group has performed its defense and security tasks very well. In recent years, Viettel has built a very strong telecommunications system, performing well the regular political tasks of the Group and our army. Viettel's network is a backup network, ensuring the country's defense and security. In fact, in recent times, when incidents occurred in key areas at sensitive times, Viettel's telecommunications network has played a very good role, contributing to the leaders of the Party, State, and Ministry of National Defense handling situations quickly, promptly, and effectively for the peaceful life of the country. The Group is also a place to foster, train, build and maintain a team of high-quality technical staff for the army and the country.

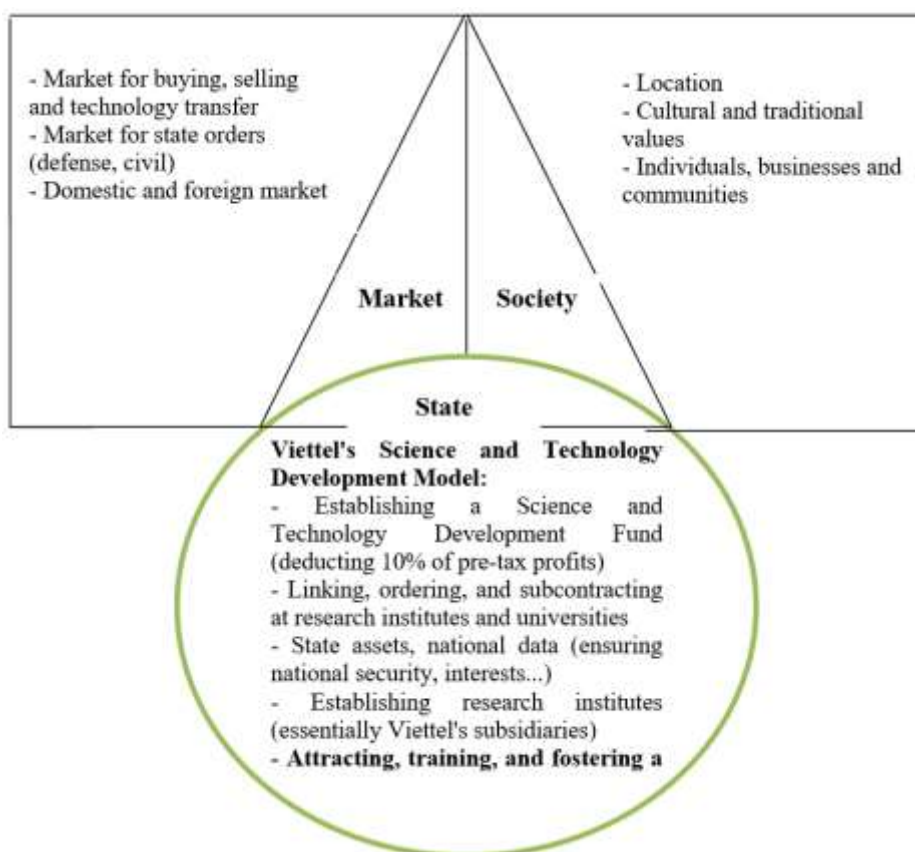


Figure 1. Science and technology management and development model at Viettel group.

To achieve today's achievements, Viettel has known how to resolve the relationship between three parties (State, market and society), promote the values of resources belonging to the State (national asset potential), the effective operating mechanism of the market (regulation, allocation of resources) and the strength of society (customer purchasing power) as follows:

(1) State resources and assets (national databases, technical infrastructure, secret key storage devices, data structures and database-using staff...) become the advantages and strengths of Viettel in providing services such as mobile services (2G-GPRS/EDGE, 3G, 4G, 5G; fixed-line and wireless telephone services; broadband internet services (ADSL, FTTH, Wimax); local channel leasing services, domestic long-distance channel leasing, international channel leasing, virtual private network services (VPN)...) to customers, because: (i) The principle of Viettel Group is to operate within the framework of the law and its guidelines (such as the Law on Management and Use of Public Assets in 2017; Law on Electronic Transactions in 2005; Law on Information Technology in 2006... and related decrees such as Decree No. 64/2007/NĐ-CP; Decree No. 106/2007/ND-CP; Decree No. 106/2007/NĐ-CP). 151/2017/NĐ-CP; Decree No. 87/2017/NĐ-CP...) ensures national security and customer benefits; (ii) The business operation mechanism of Viettel Group under the public-private partnership method (ie signing contracts to use state assets for business activities) ensures mutual benefits; (iii) Creating profits for the group and the obligation to pay full taxes to the state.

(2) Viettel Group complies with and accepts the rules of the market mechanism of "profit and loss", so the Group has aimed to master technology in the game, increase customer service and convenience in electronic telecommunications transactions. Establish a science and technology investment fund (deducting 10% of pre-tax profit), orient research topics, order technology products for institutes and universities to create source technology for the Group. At the same time, invest in training and fostering a team of qualified staff, create a coordination group in science and technology research and assign responsibility for each area (mobile and digital area, infrastructure construction area, postal area, international investment area, design consulting and customer service area) in line with the Group's development strategy. Over the years, Viettel has made breakthroughs in technology (from landline phone technology, wireless phones using 2G to 5G technology, wireless phones, internet services, line rental services...), constantly expanding the market, market share and capturing customers.

(3) Viettel's business philosophy is to uphold the law and fulfill social responsibility, that is, "business associated with social responsibility", considering each customer as "a person - a separate individual", who needs to be respected, cared for and listened to, understood and served individually. Accordingly, Viettel has proactively used its strengths to solve the development challenges of society in Vietnam as well as any country where Viettel is doing business. Viettel is also always active in building and implementing culture by identifying 8 core Viettel values, Viettel people standards, Viettel code of conduct. In 2020, along with the declaration of the mission of Building a digital society, Viettel has built a digital culture consisting of 5 characteristics: Innovation; Customer centric; Agility; Open Culture; Digital-first mindset. Because of the correct awareness of social aspects and social responsibility, Viettel brand has become known to many people, supporting the use of Viettel products and becoming the driving force for development and innovation in science and technology of the Group in the coming time.

2.1.2. The Case of Vingroup Corporation (Vietnamese Private Enterprise)

Vingroup's predecessor was Technocom Group, founded in 1993 in Ukraine. In the early 2000s, Technocom returned to Vietnam, focusing on investing in the tourism and real estate sectors with two initial strategic brands, Vinpearl and Vincom. In January 2012, Vincom Joint Stock Company and Vinpearl Joint Stock Company merged, officially operating under the Group model (under the name Vingroup Group), the group operates in association with major brands such as Vinhomes, VinPearl, VinSchool, VinSmart, VinFast... based on the social community, market mechanism and rule of law, specifically:



Figure 2.
Technology application model of Vingroup corporation.

(1) The role of the state is very important in assigning land ownership to Vingruop Group (230 thousand m² Rayol City, 360 thousand m² Time City, 2,800 thousand m² Smart City... in Hanoi; 7,850 thousand m² Imperia Hai Phong; 14,750 thousand m² Star City Thanh Hoa; 2,710 thousand m² East of Ho Chi Minh City...); encouraging the establishment of scientific research and technology application funds from various sources (from business accumulation, from business linkages, from residential communities...) to form large enterprises with influence and national brands (such as the VinFast automobile brand); forming and building centers for research, development and application of high technology in agricultural production (such as the VinMart brand), automobile manufacturing industry (VinFast brand),...; Creating a real estate market, converting land use rights and valuing land assets according to regulations (such as buying ownership of apartment buildings, exploiting urban space, contributing brand capital in business partnerships, etc.); orienting, planning and supporting the application of smart technology, urban beautification towards modernity and sustainable development (such as Smart security, smart cities, smart apartments, smart communities, etc.)

(2) Based on the recognized market economy in Vietnam: The relationship of buying - selling and transferring technology is based on the market economy, complying with economic contracts according to the law and international practices. Vingroup Corporation develops applied technology based on a transparent, public market platform and has its origin "extracted" from technology products, transferred technology, participating partners when signing contracts... specifically: Vinfast factory operates based on a technology chain that has been transferred in terms of intellectual property rights: Design (Pininfarina); technology, techniques, production methods (BMW); Factory design, management and operation (Siemens); automotive components and technology (Bosch); body (Thailand)...

(3) The social foundation is built: Customers who buy technology products (VinFast, VinMart,...) of Vingroup are mainly residents who have accessed the products provided by the Group, customers who have created a modern lifestyle (integrating Eastern and Western cultural values), a technological life in cultural connection, promoting Vietnamese values... Therefore, to affirm its name, Vingroup constantly improves product quality, providing convenient values of products and technology services, specifically: Residents living in the Vinhome apartment chain (or any customer) when buying Vinfas car brand will

enjoy free (or part of the cost) of services provided by Vingroup (restaurants, shopping, investment, education...).

3. General Assessment

3.1. Results Achieved

- The State gradually legalizes and perfects mechanisms and policies in the management and development of science and technology, that is, the State creates a legal corridor through laws, procedures, rules, programs, projects, proposals, etc. (policies) to orient, guide, create premises, stimulate, motivate and regulate activities taking place in the science and technology market with the goal of supporting and promoting the development of the national economy and society. Policies are always supplemented and perfected in each specific stage, linked to the viewpoints, leadership will and practical capacity, development trends of science and technology.
- Technology markets, technology exchanges and exhibition fairs have been established to introduce science and technology products, especially the results achieved in the Science and Technology Market Development Program such as: the institutional environment for the development of the science and technology market has been gradually improved in the direction of focusing on enterprises; creating a premise for the connection between domestic and foreign exchanges; increasing the transaction value of buying and selling general science and technology products and services of the whole economy in the period of 2012-2022 to reach 20.9%, this result is consistent with the set target.
- Currently, there are many organizations and enterprises participating in research and technology transfer: 63 centers for application of scientific and technological advances; 186 organizations providing industrial property representation services; 01 industrial property appraisal organization; 240 valuation organizations, 47 technology incubators, technology enterprises; 23 business promotion organizations; 170 co-working spaces, 50 technology transfer centers belonging to research institutes, universities and other types of organizations. In addition to the above organizations, in the system of more than 700,000 enterprises in Vietnam, there are about 25,000 enterprises registered for the field of science and technology activities, including activities related to research and technology transfer functions.

3.2. Limitations

- The system of policies and laws is still overlapping and not synchronized; economic and preferential policies... are frequently changed and difficult to access, leading to a reduction in the effectiveness of policy implementation and not creating the driving force to promote economic activities in general and science and technology in particular. On the other hand, in recent times, investment in science and technology still has many shortcomings and problems: (i) Low investment capital, the investment capital rate even decreased, going against the world's science and technology development trend; (ii) The focus and spearhead in science and technology have not been identified to concentrate investment capital on the state economic sector; (iii) The efficiency and disbursement rate of FDI capital are still low, the technology transferred through FDI investment is mainly outdated technology; (iv) Investment capital for science and technology in general and industries and fields requiring high technology content is still low.
- The science and technology market in our country is still at a low level, the market's constituent elements have not developed synchronously, that is, the capacity of many entities in the science and technology market is still low, not meeting the requirements of rapid and sustainable development of our country's economy in the current process of international economic integration.
- The proportion of public sector research and development organizations under ministries and branches is large (70%), while the proportion of organizations under universities, academies and

state-owned enterprises is small (30%). This reflects that the system of research and development organizations in our country is still independent, and the connection and interweaving with the university and business sectors is not much...

4. Solutions For Management and Development of Science and Technology in the Relationship Between the State, Market And Society

(1) *The "fundamental" solution in managing and developing science and technology is to build a strong enough State, create social development and master the "game", specifically:* (i) Building a streamlined, modern state apparatus and employing qualified staff; (ii) Improving the capacity of the legislative body (National Assembly) in law-making (increasing specialization, promulgation process, synchronous coordination and mutual supervision), the "responsiveness" of the executive body (Government) in the process of law enforcement (bringing law into life) and enhancing the "legality" of the judicial body (Court) in the process of supervising the promulgation and enforcement of law; (iii) Taking the market and society as the basis for "integration" into each policy, and at the same time as the basis for promulgating, reviewing and supplementing legal documents.

(2) *"Specific" solutions in science and technology management and development are:* (i) Developing the science and technology market in all forms (technology markets, exhibition fairs, etc.), especially establishing a modern and connected technology trading platform (from facilities, data digitization, legal consultancy, intermediary organizations, technology development trends, etc.); (ii) Establishing a national science and technology fund that is "large enough" to shape and master the "game" in science and technology management and development, the fund operates independently for the benefit and national science, from grasping technology trends, selecting research topics and socializing organizations and social communities to participate (from institutes, schools, enterprises, etc.), conducting technology transfer transactions according to market mechanisms and fulfilling responsibilities and obligations to the State; (iii) Establish intermediary organizations and consulting centers in accordance with the law, share legal information, market information, support promotion and technology transfer to participating partners.

(3) *Solution to "socialize" resources for science and technology development,* encourage and facilitate domestic and foreign scientific organizations, including individuals, to establish research and development facilities, universities, centers, vocational schools, etc. Create favorable conditions for scientists to participate in international conferences, research, exchanges, etc., and at the same time attract Vietnamese or foreign experts to participate in teaching, research or scientific consulting.

(4) *Comprehensive solutions, placed in the monitoring relationship of the parties (State, market and society) in the management and development of science and technology:* (i) The State manages the development of science and technology by law, by regulations...; at the same time, seriously handles violations of intellectual property rights, buying and selling transactions, technology transfer, environmental violations... according to the provisions of law (even criminalizing violators); (ii) Considers and handles issues related to the management and development of science and technology in the context of interests, market relations and social relations on the principle of comprehensiveness and development; (iii) Manages the development of science and technology implemented in practice in an economically and socially effective manner. In addition to handling issues by law, it is possible to use social pressure, public opinion and media opinion to adjust the trend of scientific research and technology application towards a "green - clean - beautiful" developing economy./.

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