

Research Article

Policy to Promote Technology Transfer in Vietnam

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Abstract

Technology transfer (TT) is a critical element in enhancing national innovation capacity, particularly in the context of globalization and increasing competition. In recent years, Vietnam has introduced various policies and legal frameworks to foster TT activities, with the 2017, Law on Technology Transfer and its guiding decrees and circulars serving as key milestones. Despite these efforts, the practical implementation of TT policies remains constrained by institutional limitations, inadequate implementation resources, weak coordination mechanisms among stakeholders, and limited spillover effects on the business sector. This article provides a comprehensive analysis of Vietnam's TT policy, including its theoretical foundation, current status, and key influencing factors. It also offers evidence-based policy recommendations aligned with the country's innovation and development goals. Findings show that while the policy framework for TT in Vietnam has seen gradual improvements, it still lacks coherence and strong incentive mechanisms, especially in facilitating the commercialization of research outcomes. To address these issues, the article recommends enhancing the integration of TT within the national innovation ecosystem, promoting the development of technology intermediary organizations, increasing financial incentives, and strengthening the absorptive capacity of enterprises. These measures aim to improve the effectiveness of technology transfer, thereby supporting knowledge diffusion and contributing to sustainable and innovation-driven economic growth.

Keywords

Technology Transfer, Innovation, Policy

1. Research Overview

Technology transfer is a core content in the innovation ecosystem, acting as a bridge between scientific knowledge and practical application. Technology transfer not only contributes to promoting the commercialization of research results but also creates a foundation for forming the country's endogenous technological capacity. According to OECD, technology transfer is the process of transferring technical knowledge systems - including inventions, patents, processes, software and skills - between research units and the production sector with the goal of commercializing technology [2]. Many countries have established specific legal and policy

corridors to promote technology transfer as a national strategy. Meanwhile, in Vietnam, technology transfer policy has only been clearly defined in the last two decades, with the turning point being the promulgation of the Vietnam Law on Technology Transfer in 2006 and its amendment in 2017 [15].

Theoretical approaches to technology transfer can be divided into three main groups:

- 1) Traditional model (linear model): Associated with the chain: research - development - commercialization, this model positions TT as the final stage of the R&D cycle. Many initial policies of newly industrialized countries

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(NICs) such as Korea and Taiwan originated from this linear logic, in which the state plays the role of a funder and output orientator.

- 2) Open Innovation Model [1]: Open innovation emphasizes the use of external resources in the process of technology development. TT, in this case, is a two-way exchange flow between research organizations - businesses - intermediary organizations. Many recent studies [16] indicate that this model increases the possibility of commercialization and reduces product development costs.
- 3) National innovation system (NIS) model: The NIS concept focuses on the relationship between the subjects: government, research institutes, enterprises, and markets in technology development. TT is an activity within that interaction and is governed by institutions, policies, and absorptive capacity of enterprises [17].

Many scholars have discussed technology transfer in depth in different contexts such as Chiesa et al on classifying technology transfer models in high-tech enterprises; Bozeman viewed technology transfer as a policy-institutional chain that strongly depends on intellectual property and knowledge management capacity [3]; Goswami analyzed the organizational culture factor affecting the level of technology transfer effectiveness in the South Asian context [5]; Schmidt et al focused on the institutional environment and legal corridor, considering this as a conditional factor for small and medium-sized enterprises to be able to transform research results into commercial value [4]. These studies have shown that the effectiveness of technology transfer depends not only on the source of technology but also on absorptive capacity, legal environment, intermediary organizations, innovation culture and intellectual property.

In Vietnam, there have been a number of studies addressing technology transfer and technology transfer policies. Domestic research, especially since the 2017 revised Vietnam Law on Technology Transfer came into effect, has focused on the following main groups of topics: legal framework and technology transfer policies; intermediary organizations and market conditions; and technology adoption capacity of enterprises.

- 1) Many studies have pointed out the shortcomings in the current legal system and policies on technology transfer in Vietnam. Specifically, incentive policies are not attractive enough to encourage businesses to participate in technology transfer, regulations on determining appropriate technology are still vague, and there is no clear distinction between the roles of management agencies [11, 12]. While countries such as the United States and South Korea have consistent legal corridors, allowing universities and research institutes to own intellectual property arising from public research, in Vietnam, the sharing of benefits between the state - scientists - businesses still lacks a transparent mechanism [14].
- 2) The role of intermediary organizations in technology

transfer - such as technology incubators, technology exchanges, or venture capital funds - is mentioned as an essential factor but has not yet been effectively implemented. According to NISTPASS, most technology transfer in Vietnam still takes place in the form of "internalization" between organizations with administrative relationships [9] while technology transfer on the open market is still very limited. This shows the absence of supporting institutions in terms of technical support, legal advice, technology valuation and market linkage.

- 3) Some other studies focus on the internal capacity of enterprises in receiving and absorbing technology. Studies show that the rate of enterprises investing in R&D in Vietnam is still very low, only about 10-15% of enterprises have research activities to improve products [10]. This means that technology transfer is difficult to be effective without accompanying mechanisms to improve the technological and management capacity of the private sector. Some studies also note the limited role of the university system in connecting with enterprises, making it difficult to commercialize research results [13].

Thus, research works agree that technology transfer policies need to be integrated with the national innovation ecosystem, placing enterprises at the center, and developing a technology intermediary and innovation finance system. However, according to the World Bank's assessment, most current policies only stop at the general incentive level, lacking specificity by industry, locality and technology type. There are not many studies on evaluating the effectiveness of implementing technology transfer policies by region; pricing mechanisms and protection of transferred technology; and linking technology transfer with sustainable development goals [15].

2. Research Method

The paper uses a qualitative approach combined with comparative policy analysis to assess the current status and effectiveness of technology transfer policies in Vietnam in relation to the international context. At the same time, the study is based on a multidimensional analytical framework, integrating the national innovation system (NIS) and the public policy cycle to clarify the cycle of forming, implementing and adjusting technology transfer policies. This approach allows: identifying the content and scope of technology transfer policies in Vietnam; assessing factors affecting the effectiveness of policy implementation; comparing Vietnam's policies with those of countries with developed technology transfer ecosystems such as the United States, South Korea and China.

The article uses secondary data from the following sources: Relevant legal documents: Law on Technology Transfer (2017), Decree 76/2018/ND-CP, Law on Intellectual Property (amended), decisions and programs of the Government on

innovation, technology funding, innovative startups; at the same time, using summary reports, yearbooks and statistical documents from the Ministry of Science and Technology, World Bank, OECD and related international magazines and organizations.

In addition, the article uses case study methods; qualitative content analysis: used to dissect the structure and content of current policies, identify strengths, weaknesses and policy gaps; comparative policy analysis: comparing Vietnam's technology transfer policy with typical countries to identify specific factors and the ability to adjust policies in the context of Vietnam; systematic analysis: to determine the relationship between policy factors (institutions, finance, human resources, intellectual property, intermediary organizations) and the level of technology transfer effectiveness.

The limitations of the paper are that the study mainly focuses on national-level policies and does not delve into specific sectors. Quantitative indicators of technology transfer efficiency are extracted from official published reports, and no primary survey is conducted. Therefore, the representativeness of some conclusions may be affected by the reliability of secondary data. The study mainly analyzes policies issued and implemented in the period from 2017 to present (since the amended Technology Transfer Law took effect).

3. Research Results

About the experience of some countries in the world:

United States: Market-based technology transfer policy and intellectual property protection. The United States adopts a market-based technology transfer model, encouraging the commercialization of research results from research institutes and universities. The Bayh-Dole Act of 1980 allows organizations receiving federal grants to retain intellectual property rights to inventions from funded research, facilitating technology licensing and commercialization. The Federal Technology Transfer Act of 1986 promotes collaboration between federal laboratories and the private sector, through cooperative research and development agreements (CRADAs). Results: The United States' technology transfer policy has led to the strong development of the innovation ecosystem. Since the Bayh-Dole Act was enacted, more than 11,000 startups have been founded based on technology from federally funded research institutions, contributing more than \$1.3 trillion to the U.S. economy and creating more than 4.2 million jobs.

Korea: State-led technology transfer policy and public-private partnership promotion. Korea has established a legal system to promote technology transfer among research institutes, universities, and enterprises. The Technology Transfer and Commercialization Promotion Act, enacted in 2000, requires public universities and research institutes to establish technology transfer offices (TLOs) to manage and commercialize technology. In addition, the Industrial Education Promotion and Industry-Academia Research Cooperation

Promotion Act of 2003 encourages cooperation between research institutions and enterprises, and promotes technology transfer through joint projects and financial support. Results: Korea's technology transfer policy has promoted the development of TLOs and enhanced cooperation between the public and private sectors. However, some studies show that despite the increase in the number of TLOs, the quality and efficiency of TT remains limited, due to lack of experience and resources in technology commercialization.

China: Technology Transfer Policy Guides Strategy and Supports Technology Localization. China has adopted technology transfer policy to promote technology localization and develop strategic industries. The Chinese government has used measures such as requiring technology transfer in joint ventures, providing financial support for domestic enterprises to acquire technology from abroad, and encouraging overseas Chinese experts to return home through programs such as the "Thousand Talents Program". In addition, China has enacted policies to control technology exports and protect intellectual property rights, such as the Technology Export Management Law and regulations related to technology transfer in sensitive areas. Result: China's technology transfer policy has contributed to the rapid development of high-tech industries, such as artificial intelligence, telecommunications, and renewable energy. However, measures such as forced technology transfer requirements have caused trade tensions with international partners, especially the United States, leading to the imposition of sanctions and export controls on China.

Countries such as the United States, South Korea and China adopt different ICT policies, reflecting their distinct economic development priorities and strategies. The United States focuses on markets and intellectual property protection, South Korea promotes public-private partnerships under state leadership, while China has a strategic orientation towards technology localization and development of key industries. Vietnam can learn from these models to build appropriate ICT policies to promote innovation, economic development and effective international integration.

On the quantity and value of technology transfer in Vietnam:

According to the Ministry of Science and Technology [7], from July 2018 to the end of 2023, the country has granted Registration Certificates for 579 technology transfer agreements, including new issuance, extension, amendment, and supplementation of technology transfer content. Of which, 493 contracts belong to foreign-invested enterprises (FDI), accounting for about 85% of the total number of contracts, with only 2 technology transfer contracts from Vietnam to foreign countries (Japan and Switzerland). This shows that technology transfer activities mainly take place from foreign countries to Vietnam, while the opposite direction is still very limited. In addition, in the period of 2023-2024, the Centers under the Department of Science and Technology in Vietnamese provinces/cities have implemented 252 consulting and technology transfer contracts. Major fields include agri-

culture, information technology, environmental treatment, radiation safety, energy, testing.

The total value of technology transfer contracts in the 2018-2023 period is estimated to reach over VND 114,000 billion [7]. Of which, contracts related to FDI enterprises account for about VND 106,000 billion, equivalent to 93% of the total value, demonstrating the leading role of the FDI sector in technology transfer activities in Vietnam. In addition, in the 2021-2022 period, Vietnam recorded 161 technology transfer contracts, with a total value of about VND 30,000 billion. Of these, 130 contracts (accounting for 81%) belong to FDI enterprises, with a value of about VND 28,000 billion.

Technology transfer contracts mainly focus on areas such as electronics, automobile, motorbike manufacturing (including manufacturing of components and spare parts), pharmaceuticals, medical equipment, petrochemicals, cosmetics, beverages, biology, animal husbandry, mineral exploitation and processing, and construction. Regarding transfer partners, enterprises from industrially developed countries such as Japan, Korea, the US and some European countries (Spain, the Netherlands, Austria, Ukraine, France, Belgium, Germany, the UK, Switzerland, Bulgaria) play an important role. In addition, ASEAN countries such as Thailand, Singapore and China also participate in technology transfer activities, especially in the field of automobile and electric motorbike manufacturing.

On Vietnam's policy to promote technology transfer:

The Law on Technology Transfer 2017 (amended) is a fundamental legal document, stipulating the principles, rights and obligations of parties participating in technology transfer activities [6, 18]. This Law emphasizes the encouragement of the transfer of advanced and high technology from abroad to Vietnam, while promoting the transfer of technology domestically and from Vietnam to foreign countries. In particular, the Law clearly stipulates the list of technologies encouraged, restricted and prohibited from transfer, creating a legal basis for the management and promotion of technology transfer activities. Next, Decree No. 76/2018/ND-CP, issued on May 15, 2018, provides detailed guidance on the implementation of a number of articles of the Law on Technology Transfer. This Decree stipulates the order and procedures for technology transfer registration, the mechanism for monitoring, evaluating and inspecting technology quality, and regulations on forms of support and incentives for technology transfer activities. In particular, the Decree emphasizes the encouragement of technology transfer in priority areas such as agriculture, processing industry, information technology, and renewable energy.

Regarding financial support and incentives. The National Technology Innovation Fund (NATIF) is a non-budgetary state financial fund under the Ministry of Science and Technology, operating on a non-profit basis. The fund's function is to provide financial support to enterprises, organizations and individuals conducting research, application, transfer, innovation and technology improvement. Forms of support in-

clude preferential loans, loan interest support, loan guarantees and capital support [6, 18]. NATIF prioritizes supporting small and medium enterprises, innovative start-ups, and projects in the fields of high technology and advanced technology. In addition to support from NATIF, enterprises participating in technology transfer activities also enjoy incentives on corporate income tax and import tax on machinery, equipment and materials that cannot be produced domestically. In addition, the state also supports human resource training costs, research and development costs, and technology testing and inspection costs. These policies aim to minimize risks and costs for businesses when adopting and applying new technologies.

Impact of Vietnam's policy of promoting TT on socio-economy:

Impact on economic growth and labor productivity: The policy of encouraging technology transfer has played an important role in promoting economic growth and improving labor productivity in Vietnam. According to the Ministry of Science and Technology [7], in the period 2016-2020, the number of technology transfer consulting contracts reached 14,907 contracts, with a total value of VND 290 billion, an increase of 32% compared to the period 2011-2015. This increase reflects the efforts of the centers in promoting technology transfer, contributing to improving productivity and production efficiency. In particular, in the industrial sector, technology transfer has helped many businesses access advanced technology, thereby improving production processes and product quality [8]. For example, the Vietnam Oil and Gas Group (PVN) has applied modern technologies in oil and gas exploitation, such as seismic processing software and field modeling, contributing to maintaining production output and ensuring national energy security.

Impact on economic structure and competitiveness. The technology transfer policy has promoted the economic restructuring towards modernization, enhancing the competitiveness of the economy. Through foreign direct investment (FDI) projects, many new technologies have been transferred to Vietnam, especially in fields such as electronics, telecommunications, and high technology. This not only helps improve product quality but also expands export markets, contributing to sustainable economic growth [7]. However, it should be noted that most of the technology transferred through FDI is medium technology, with the proportion of advanced technology accounting for only about 6%. This poses a challenge in improving the quality of technology transfer to truly promote innovation and enhance national competitiveness.

Impact on human resource and social development. Technology transfer policy has also made an important contribution to human resource development and improving the quality of life. The reception and application of new technology requires a highly skilled and qualified workforce, thereby promoting training and human resource development. According to the Ministry of Science and Technology [7], the

number of employees working in consulting and technology transfer centers increased by 30% in the period 2015-2020, with a significant increase in the number of masters and doctors. In addition, technology transfer also contributes to improving the quality of life through the application of technology in areas such as health, education, and the environment. For example, the application of biotechnology in agricultural production has helped improve productivity and product quality, while minimizing negative impacts on the environment.

Limitations of Vietnam's policy of promoting TT to socio-economy:

Limitations in attracting and quality of technology from FDI sources. Although Vietnam has attracted many foreign direct investment (FDI) projects, the quality of transferred technology is still limited. From July 2018 to the end of 2023, the whole country had only 579 technology transfer agreements granted Registration Certificates, of which 493 contracts belonged to FDI enterprises [7, 10]. However, many transferred technologies are average technologies, which have been and are being widely used in the home country, not meeting the country's development requirements in the new situation. In addition, FDI enterprises mainly focus on assembly and processing with low localization rates, and the value created in Vietnam is not high. This leads to the diffusion of technology from FDI enterprises to domestic enterprises not being as expected. The technology absorption capacity of domestic enterprises is still weak. The ability to absorb and master technology of domestic enterprises is still limited, especially in small and medium enterprises. The main reason is the lack of financial resources, high-quality human resources and experience in receiving and applying new technology. In addition, the connection between domestic enterprises and FDI enterprises is still loose; FDI enterprises only buy about 26.6% of equipment and inputs from Vietnamese enterprises, the rest is imported and imported from foreign companies.

The legal system and management mechanism are not yet synchronized. The legal system and management mechanism on technology transfer still have many shortcomings, lack of synchronization and effectiveness. The appraisal and supervision of technology in investment projects are still neglected [7, 8]. Many outdated and environmentally polluting technologies have been transferred and installed in projects due to the lack of close coordination between state management agencies. In addition, some enterprises have taken advantage of legal loopholes to illegally transfer technology, causing difficulties for management agencies in inspecting and supervising technology transfer activities.

Lack of support and incentive mechanisms for domestic enterprises. Current policies to encourage technology transfer are not really effective in supporting and promoting domestic enterprises to receive and apply new technologies. Investment in science and technology development is still limited, financial mechanisms are heavily administrative and subsidized,

not creating favorable conditions for enterprises to innovate technology. In addition, the ordering of research for science and technology entities is still limited and not closely linked to the practical needs of enterprises and the market.

Lack of high-quality human resources and supporting infrastructure. High-quality human resources in the field of science and technology are still lacking and do not meet the requirements of the technology transfer process. Training and fostering human resources to improve the capacity of science and technology entities still have many limitations. In addition, supporting infrastructure for technology transfer activities, such as technology brokerage centers and business incubators, is still lacking and has not been effective. This reduces the ability to connect stakeholders in the technology transfer process.

4. Conclusion and Recommendations

The policy of promoting technology transfer in Vietnam in recent years has achieved a number of important achievements, playing a positive role in the process of economic modernization, increasing labor productivity, supporting industrial development and improving the quality of human resources. Through channels such as foreign direct investment (FDI), research cooperation, innovation programs and technology transfer centers, Vietnam has gradually accessed many advanced technologies in the world. However, reality also shows that there are still many shortcomings and limitations in the implementation of technology transfer policies, including: weak technology reception capacity, asynchronous legal framework, ineffective support systems, and lack of connection between stakeholders. The transfer is mostly average technology, with little breakthrough, limiting the ability to increase added value and sustainable development of the economy. Therefore, in the coming time, to promote positive impacts and overcome current limitations, it is necessary to synchronously deploy the following groups of solutions:

Perfecting the legal system and policy mechanisms on technology transfer: Updating, supplementing and synchronizing legal regulations related to technology transfer, especially in the Law on Technology Transfer, Law on Science and Technology, Law on Investment; Establishing a mechanism for evaluating and monitoring more closely the technology content in investment projects, especially FDI projects; Strengthening preferential tax, credit and financial support policies for domestic enterprises to implement technological innovation.

Perfecting policies to improve enterprises' ability to absorb and master technology: Organizing training, consulting and technical support programs to improve the ability to receive and apply technology for small and medium enterprises; encouraging domestic enterprises to participate more deeply in the value chain of multinational corporations, through building a network of connections and transferring supporting technology.

Boost investment in research and development (R&D): Increase the budget expenditure on science and technology to a minimum of 1.5% of GDP as recommended by UNESCO; encourage the private sector to invest in R&D through tax exemption/reduction policies, capital funding or co-financing with the state; build a research ordering mechanism linked to market demand, especially in potential areas such as high-tech agriculture, healthcare, and renewable energy.

Developing a technology transfer ecosystem: Forming national and regional technology intermediary centers, operating as technology exchanges, brokers and evaluators; Developing a system of incubators, innovation centers, high-tech zones associated with universities and research institutes; Establishing an open and interconnected database on technology to facilitate businesses' access to domestic and foreign technology sources.

Developing high-quality human resources: Building a human resource training strategy associated with the 4.0 technology trend, focusing on industries such as automation, AI, biotechnology, new materials; connecting more closely between universities, research institutes and businesses to provide human resources that meet actual needs.

Thus, effective technology transfer not only helps Vietnam catch up with the trend of technological globalization, but is also an essential condition to improve national competitiveness. Therefore, perfecting the technology transfer policy should be considered a strategic priority in the process of socio-economic development. With high political determination and the synchronous participation of relevant parties, Vietnam can completely turn technology transfer into a key driving force to promote industrialization and modernization in the current digital transformation era.

Abbreviations

TT	Technology Transfer
AI	Artificial Intelligence
ICT	Information and Communication Technology

Author Contributions

Nguyen Huu Xuyen is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

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