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**Article**

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# SHIFTING PARADIGM IN SCIENCE, TECHNOLOGY AND INNOVATION POLICY OF VIETNAM IN THE INTERNATIONAL INTEGRATION PROCESS

*Vietnam has experienced crucial transformations in every turning point of the world history. In this process, along with changes in the economic model, social institutions, are changes in the Government's management method in specific areas, especially in the shift from a centrally-planned to a socialist market-oriented economy. Vietnam's science, technology and innovation system has also gone through innumerable reforms to evolve, adapt and positively energize self-innovation. Science, technology and innovation indicators are embedded into the strategic goals of national policies and entered into every area, every sector (public and private) and individuals/ organizations in Vietnam. In the context of international economic integration and the fourth industrial revolution, science, technology and innovation have become the targets and means for socio-economic development more than ever before. This paper aims to explore the philosophical moves in Science, technology and innovation management in Vietnam. It will clarify successes and challenges in the context of international integration. The first part of the paper discussed the concepts and approaches in policy and innovation research, since these aspects have not been fully established and agreed in previous studies in Vietnam. Secondly, the author reviewed and assessed the changes in Vietnam's science, technology and innovation policy framework to observe the four philosophy shifts of the relationship between the State and the science, technology and innovation system through the periods. Thirdly, changes in policies resulted in changes in resources, organizational structure, operational content and correlation as well as the position of elements in the science and technology and innovation system. The last part addresses macro and micro policy solutions for the development of the science, technology and innovation system for Vietnam in a new, potential, but risky context. Accordingly, science, technology and innovation policies need to be more "open" and "autonomous" to ensure the self-fulfillment, adaption and innovation of the science, technology and innovation system.*

***Key words**: science, technology, innovation system, integration*

## Introduction

Vietnam is moving from a centrally-planned to a market-oriented economy as a consequence of social needs. This is considered an imperative move after months of crisis and stagnation. It is a huge achievement that Vietnam is transformed from a poor, low-income country to a middle-income with high growth rates, and increasingly integrate with the region and with the world. The changes of each

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individual, each level of management, each field and each policy have contributed to create new stages of development for Vietnam. Among the mentioned factors are Science, Technology and Innovation (STI) policies.

STI has become an important factor in measuring the quality of national growth. The world's STI development trends have firmly driven the development choices of Vietnam in the past few years as well as in the future. Vietnam is striving to become a fundamentally industrialized country; the average GDP per capita is expected to be in the group of countries with medium level of development in the world by 2020. Are these strategic objectives feasible? What will be the direction for STI policy in order to reach those strategic objectives? Vietnam is in the process of integration and thus there will be changes in STI management policy as a result of the unavoidable movement of the market-oriented economy and the world's STI development trends. Moreover, these changes will become a stepping-stone for Vietnam to more inclusive integration with the world.

**1. Overview of definitions and approaches in science, technology and innovation policy research**

A number of phrases have been used in recent policy documents such as innovation/creativity, national innovation system, innovation ecosystems, Science, Technology and Innovation System in Vietnam. However, these concepts are not easy to understand and clarify. They are not used consistently although some of them are defined in Laws. Therefore, the study of the theoretical basis of STI system is not only a prerequisite for shaping national development strategy in Science and Technology, but also a shift in the perception of science, technology and innovation management. In the context of the fourth industrial revolution (Industry 4.0) and the supportive, expanding startup ecosystem, the term "innovation" is increasingly mentioned. There are many definitions of "innovation", however, there is no consistent and well-defined one. Why is "innovation" meant "doi moi sang tao" rather than "doi moi" – as in the sense of the word.

The concepts of "innovation" & "science, technology and innovation" were first introduced in Vietnam in 1980s by Hungarian researchers. It firstly appeared in scholarly in the 1990s, under the SAREC project conducted by Nguyen Thanh Ha, Tran Ngoc Ca and Nguyen Vo Hung [1]. "Innovation" comes from the Latin word "nova", which literally means "new" and it frequently refers to the beginning of an incident or a new solution The reason for translating "innovation" as "doi moi sang tao" is not to make any confusion with the notion of "Doi Moi" which emerged in 1986 in the documents of the Communist Party of Vietnam.

However, Vietnam's "Doi Moi" policy is known as "Renovation" or "Reform" but not "Innovation" in English documents. According to Wikipedia, "Doi Moi (Renovation) is a name for reforms initiated in Vietnam in 1986 ...". In term of meaning, Vietnam's "Doi moi" should be called "Cai Cach" (Renovation/Reform). Thus, instead of using the term "doi moi sang tao", the author used "Doi moi" for the word "innovation" in this study.

To date, there has not been an universal understanding of innovation. OECD (2005), for example, defines innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method,

or a new organizational method in business practices, workplace organization or external relations" [2].

In 2011, Crossan and Apaydin developed a definition which is based on the OECD's definition, that is, *"Innovation is production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and the establishment of new management systems. It is both a process and an outcome"* [3]. This is considered the most complete definition. ISO (2015), meanwhile, defined innovation as *"New or changed object, realizing or redistributing value"* [4].

In clause 16 of Article 3, the Law on Science and Technology of Vietnam 2013, a definition of innovation is given: *"Innovation is the creation, application of technical & technology achievements and solutions, management solutions to promote socio-economic development, productivity, quality and added value of products and goods"* [5].

According to the mentioned definitions above, it is easily to mix up "innovation" with "invention". However, these two words are not synonyms and they are completely different. Both innovation and invention are related to new things. While invention refers to the creation of a new product, innovation implies the values of the new product.

The term "STI system" already consists of the purpose of the whole system – which is "innovation", the tool of innovation - "science and technology" and the core tool - "R&D". STI include not only enterprises, universities and research institutes, but also other organizations such as associations and non-commercial organizations. STI system consist of a set of components that interact in pairs M (Market) – R (Research) – D (Deployment) – P (Production).

The scope of STI policy, therefore, is quite broad, covering not just science or technology. Furthermore, STI policy is linked with not only S&T policy framework but also other related policies such as taxation, finance, business, intellectual property.... STI policy has the characteristics of improvement (the old/the existing things), adaption (with the environment) and self-innovation.

**2. Changes in the paradigm of science, technology and innovation in the context of international integration**

The state is the decisive factor in management philosophy of S&T. The state expresses its role through policies (announced or implicit) in science, technology and innovation. Government interventions in the centrally planned economy were more evident, from the organization, participation, financing, to the evaluation and use of research results... In order to achieve greater results, Government gradually changed to support and encourage other sectors to participate in S&T activities by offering a number of "rights" and "benefits" in finance and management. This creates the demand and linkage between S&T and S&T human resources, creating a driving force for the innovation process.

Throughout the research, the author acknowledged and used the research results of Vu Cao Dam about the four philosophies in STI management [6]. This report will give a brief overview of the content and characteristics of each philosophy.

*Philosophy 1: STI is a private concern, Government is not interested in STI.*

Science, technology and innovation are only the interests of brilliant scientists, academic institutions with an intense passion for discovery. Science, technology and innovation activities are conducted using the expense of that individual or that organization. The use of R&D results is also personal.

*Philosophy* 2: Government's concern for STI is equal to its concern for other elements

The Government opens schools and institutes to create environment for scientific research and technological development. At the same time, science and technology are considered a factor, a tool for socio-economic development. For instance, the Government issued a decision to establish 53 research institutes in 1975, and by 1980, the number of institutes increased to 107. The state has managed these science and technology organizations equally to other elements.

*Philosophy* 3: The State is the only entity that organizes and administers STI system.

This philosophy is evident in the centrally planned economy. In this period, STI policies was characterized by the fact that the State dominated authority in allocating resources (financial resource, human resource, material resource…) and strictly governed STI activities. Other factors in STI system only implemented the established policies and plans. This philosophy has basic characteristics such as: there was a "template" of planning the S&T development for all STI activities, STI system was arranged vertically with the administrative management level, the source of funds for STI activities were mainly provided by the State, governmental S&T management units were established, the State self-evaluated and used research results for innovation purposes. The STI policy in this period of time is compared to a barrier which prevented the proactive and flexible nature of STI (because STI activities were tied to socio-economic plans in each phase); it also restricted potential development of other components in STI system.

*Philosophy* 4: STI system is under macro-management of the state

When STI activity becomes a social activity, becoming the concern of the whole community and following the "market-oriented" mechanism, the government must turn to macro management. In line with macro-management, the state governs by macro-level institutions, decentralizing autonomy and self-responsibility to STI system's elements. The state plays a role as a "sponsor" of STI activities.

After long period of development, Vietnam STI policy has reached considerable achievements. In the line with each development stage of the country, STI policy has undergone its own changes. IT can be seen through the milestones summarized in the table below:

*Table 1*

**Changes in management philosophy of STI in Vietnam**

| Year/ Period | Philosophy | Regulations |
|---|---|---|
| **1981** | Decentralization of STI activities | Decree 175/ CP |
| **1987** | - De-administration of STI<br>- Commercialization of R&D outputs | Decree 134/ HDBT |
| **1988** | Privatization of Technology Transfer Activities | Decree-Law |
| **1992** | Privatization of all STI System | Decree 35/ HDBT |
| **1992-2005** | No change in STI Governance Philosophy | |
| **2005** | Autonomation of public R&D organizations | Decree 115/2005/ND-CP |
| **2006** | Autonomation of public affairs organizations | Decree 43/2006/ND-CP |
| **2007** | Establishment of Engineering Enterprise | Decree 80/2007/ND-CP |
| **2010** | Improvement of Decree 115 and Decree 80 | Decree 96/2010/ND-CP |
| **2015** | Autonomation of public organizations | Decree 16/2015/ND-CP |
| **2016** | Autonomation of public R&D organizations | Decree 54/2016/ND-CP |
| **Foresight** | Autonomation of STI system | Some Decrees |

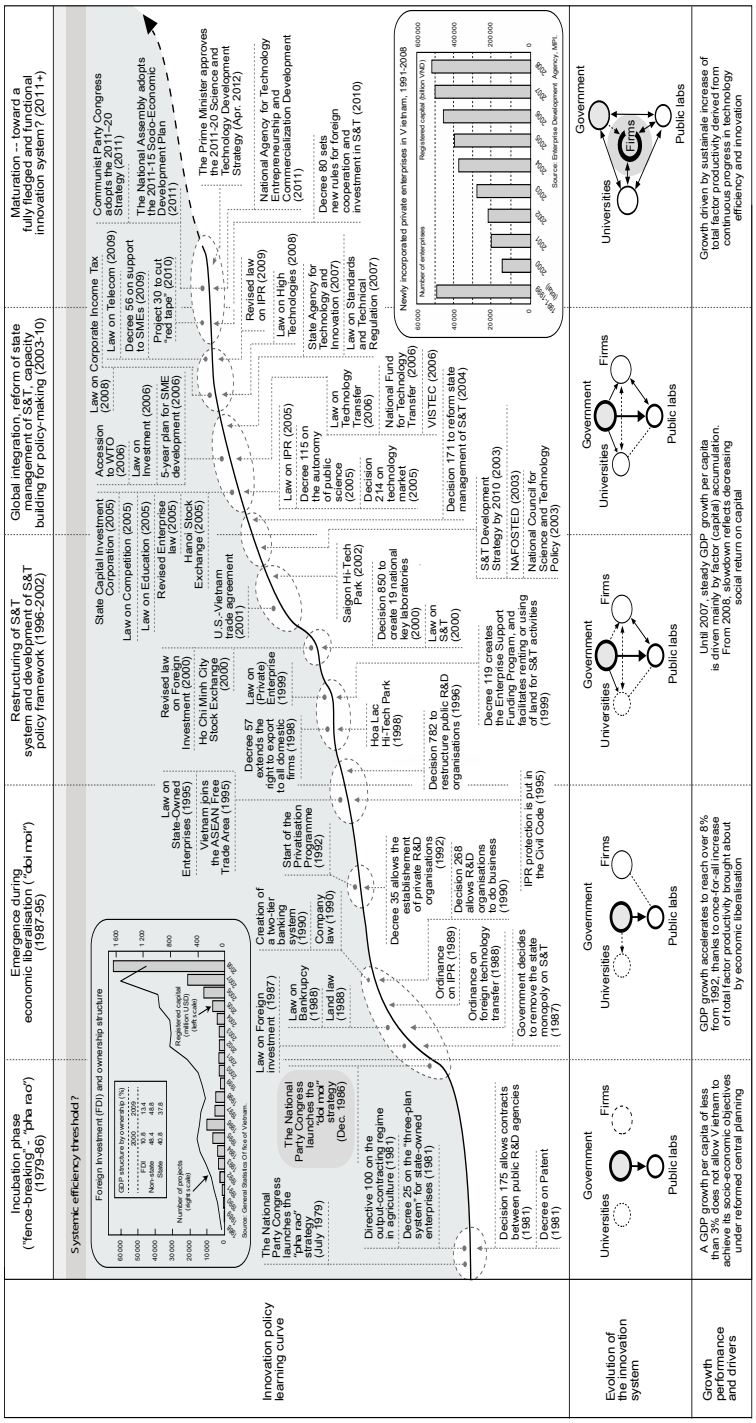
*Source:* Vu Cao Dam (2017), Science and Technology Management Lecture

The World Bank and the OECD's 2014 report on *"Science, Technology and Innovation in Vietnam"* modeled the development of Vietnam's STI policy system as well as the relationships of STI system's elements between 1979 and 2011 [7] (Figure 1).

According to the report, from 1979 to 2010, the state always played the ultimate role in controlling the STI system. In the first stage, enterprises, universities, and the state are independent subjects, and therefore cannot be considered a system. In the following stages, individual relationships are established between these elements and gradually become a closed system in which the elements interact with each other, taking the enterprises at the center.

This not only reflects the change in the awareness of the state when it is more focused on innovation as a factor that boosts the whole STI system in the context

Figure 1: Innovation policy in Vietnam




Source: OECD.

*Source: WB, OECD (2014), OECD Reviews of Innovation Policy: Science, Technology and Innovation in Vietnam*

of international integration, but also expresses the awareness of the state's role in managing the STI system. The state is no longer a monopoly subject in that system; it is not a stand-alone entity that "do" science but must be the subject that "manage" science.

However, Vietnam's STI policy still has many limitations, unfortunately these have become a barrier for Vietnam in the progress of integration into the world. With the characteristics of the state-run economy, Vietnam has no policy for the organization and operation of R&D organizations in the universities, thereby, there are a large number of research institutions which is not associated with production and training; enterprises have no desire for innovation.

STI policy still persists in S&T "push-policy" thinking. According to this thinking, the whole STI system is always striving to "create market". However, this "market" does not create the need for technological innovation. Policy efforts are aimed at stimulating the supply side, but the demand side is the decisive factor in the enterprises' desire for innovation. When there is supply factor but no demand factor, the initiatives, researches from the "supply side" are outside the enterprises. Most importantly, Vietnam has not had a perfect market-oriented economy. That is the most important reason for no competitive element appeared, forcing enterprises to innovate in technology.

**3. Impact of STI policy change on STI system of Vietnam**

With the transition in policy, STI system in Vietnam has changed from subsidized science to market economy science and integrates with the world. These impacts are evident in the development trend of resources (human resources, finance resource, infrastructure, and information resource for STI); in the changes in organizational structure and ownership; the content of STI activities, correlations and positions among elements in STI system (institutes, universities, enterprises, state). According to the research results of State level research project KX06.06/11-15 on *"Researching and analyzing science, technology and innovation system in Vietnam in the context of international integration of science and technology",* STI system has been showing many weaknesses under the impact of STI policy [8]. One of the features of STI activities in Vietnam is that there is insufficient involvement of the private sector, low and ineffective levels of state investment, and poor outcomes compared with social and economic demand.

Taking each element into consideration, universities play an important role in the creation of intellectual property, including invention/research results and thereby encouraging innovation. Moreover, universities are also training centers of S&T human resources. Although many universities have achieved great success in technology transfer and commercialization of inventions, the contribution of S&T and technology transfer activities at universities in Vietnam to social demand is still limited, it does not meet the potential of a large number of scientists and researchers.

The interaction between the two subjects: university/research institutes with enterprises is very spontaneous, fragmented, and not systematic. Research institutes depend greatly on the State for their strategy, personnel, funding, …and simply perform research function. In term of enterprises, scientific staffs are limited in number and capacity constraints, not meeting the requirements of national development. The distribution of human resources and level structure is not reasonable by regions and

operation areas. The problem of manpower shortage is not resolved yet. Enterprises only spend about 10% of their revenues on STI investments. According to the survey results, the expenditures of S&T activities of enterprises mainly come from private sources. It can be concluded that STI policy has influenced the STI system and leads to three major consequences:

*Firstly,* there is the fragmentation and separation in the "training-research-production" relationships. Most enterprises do not have R&D department; research institutes in S&T branches are separated from enterprises and universities; the fundamental sciences institutes and social sciences and humanities institutions separate from universities; universities just focus on lectures, completely separating from science.

*Secondly*, there is no useful linkage between the areas in Vietnam's STI system, which is Institutes - Universities - Enterprises.

*Thirdly,* in spite of many changes, the STI system in Vietnam is also bearing the stamp of a system in the centrally-commanded economy, which state management still dominates.

According to the ranking of the Global Innovation Index (GII) in 2018, Vietnam jumped two ranks compared to 2017, and 14 ranks compared to 2016, reaching the rank of 45/126 nations [9, 10]. In particular, development indicators based on research and development (R&D) and innovation have made significant progress. However, the index of "institution" is always in the low position and difficult to change compared to other indicators.

*Table 2.*

**Some indicators of Vietnam's innovation in 2017 and 2018 according to GII**

| Year | 2017 | | 2018 | |
|---|---|---|---|---|
| Indicator | Score | Rank | Score | Rank |
| Overall rank | 38.3 | 47 | 37.94 | 45 |
| Institution | 52.8 | 87 | 56.2 | 78 |
| Human Capital and Research | 31.0 | 70 | 30 | 66 |
| Infrastructure | 42.7 | 77 | 40.4 | 78 |
| Market Sophistication | 52.8 | 34 | 54.3 | 51 |
| Creative Outputs | 34.8 | 52 | 35 | 46 |

Source: WIPO, Global Innovation Index 2018: Energizing the world with innovation and Global Innovation Index 2017.

The report *"Vietnam 2035: Toward Prosperity, Innovation, Equity and Democracy*" in 2016 claimed that *"Vietnam's innovation performance is weak, both in terms of supply and demand"* [11]. The private sector's perceptions of research quality and cooperation between enterprises and the research areas show that Vietnam is behind other countries with similar levels of development. Enterprises in Vietnam generally underestimate the quality of research and the collaboration of public research institutes with the private sector.

Moreover, a number of policy and institutional issues are becoming more intense and more urgent: State-owned enterprises operate inefficiently, domestic firms performed poorly, and a fragmented agricultural sector in which smallholders dominate besides the strong participation of the state. These have raised the crucial concern: how to overcome the current difficulties. Therefore, in the report on *"Science, Technology and Innovation in Vietnam"* (2014), the World Bank and OECD made the first recommendation to promote STI system in Vietnam: *"improving the legal framework for innovation"* [7].

**4. Orientation and solution for Vietnam's STI policy in the context of international integration**

Vietnam is not an oasis of a world in a fast integration. Therefore, STI policy is not an exception. This means that STI policy has to be integrate with its own right. The process of restructuring STI system in Vietnam is not a simple process but a two-stage process of restructuring:

Stage 1. Overcoming barriers from the old system

Stage 2. Integrating in the world's restructuring trend

In essence, Vietnam's economic reform is a shift from a centrally-planned economy to a market-oriented economy. This is characteristic of the restructuring process of the economy in general, and the restructuring process STI system in particular. Vietnam's STI system, along with other countries, must overcome the backwardness of the world's STI compared to the general trend of the time. The following groups of solutions for STI should be implemented in order to accomplish the two stages.

*Macro solutions for STI policy focuses on:*

- Transiting from state-owned STI system to a multi-sector STI system and ensure equal rights for those sectors. This has been implemented in reality, but the non-public sector is still very weak.

- Recreating the relationships between research, training and production.

*Micro solutions for STI policy focuses on:*

- Increasing salaries and research investment for the university sector in order to attract S&T personnel to the university, thereby enhancing the research function for the university sector. In addition, within the autonomy, self-responsibility STI system, universities are empowered to decide on training disciplines, enrollment quotas, training programs and international cooperation programs.

- Developing training activities in academic institutions. In fact, the Vietnam Academy of Social Sciences has owned the Academy of Social Sciences with the function of training S&T human resources. The Vietnam Academy of Science and Technology also has University of Science and Technology Hanoi (also known as Vietnam France University). These are good preconditions for the connection between training and research. This model should be promoted to connect the two functions: training and scientific research, improving the quality of training and the effectiveness of scientific research, increasing the applicability and transfer of universities' and institutes' scientific research results in practice.

Based on this model, available resources on S&T human resources as well as scientific research environment are utilized to serve the training, scientific research and production. At the same time, this integration method will enhance the capacity

of S&T personnel in the direction that university lecturers and institutes' researchers carry out both scientific research and training job.

In conclusion, the context of international integration, especially the Industry 4.0 is having a great influence on the STI system management policies of Vietnam. STI policies need to have more "open" and "autonomous" orientations towards STI elements and S&T activities, ensuring that STI system can evolve, adapt and self-innovate.

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## ЗМІНА ПАРАДИГМИ НАУКОВОЇ, ТЕХНОЛОГІЧНОЇ ТА ІННОВАЦІЙНОЇ ПОЛІТИКИ В'ЄТНАМУ У ПРОЦЕСІ МІЖНАРОДНОЇ ІНТЕГРАЦІЇ

Під час кожного переломного моменту світової історії В'єтнам зазнавав доленосних перетворень. У цьому процесі зміни в економічній моделі та соціальних інститутах країни відбуваються паралельно зі змінами в державному управлінні у конкретних сферах, особливо під час переходу від централізовано планованої до соціалістичної ринкової економіки. Система науки, технологій та інновацій (система НТІ) В'єтнаму також зазнала безлічі реформацій, під час яких вона розвивалася і спонукала свої складові елементи до позитивних самоінновацій. Показники науки, технологій та інновацій закладають у стратегічні цілі національної політики для кожної галузі і кожного сектора (державного та приватного) країни, а також для всіх приватних осіб та організацій В'єтнаму. В умовах міжнародної економічної інтеграції та четвертої промислової революції наука, технології та інновації більше, ніж будь-коли, становлять цілі та засоби соціально-економічного розвитку. Ця стаття аналізує теоретичні підходи до політики у сфері науки, технологій та управління інноваціями у В'єтнамі, що дає змогу визначити досягнуті успіхи та виклики, які постають у контексті міжнародної інтеграції.

Розглядаються концепції та підходи щодо дослідження політики та інновацій, оскільки в попередніх дослідженнях вітчизняні науковці не дійшли щодо них згоди та недостатньо повно їх визначили. Також проаналізовано зміни у політиці країни стосовно науки, технологій та інновацій, щоб дослідити, як трансформувалися відносини між державою та системою НТІ упродовж різних періодів. Зміни у політиці викликали зміни в ресурсах, організаційній структурі, оперативному змісті та взаємозв'язку між елементами, а також щодо місця кожного елемента у системі НТІ. Останнє стосується макро- та мікрополітичних рішень щодо розвитку у В'єтнамі системи науки, технологій та інновацій у новому, потенційно прогресивному, проте ризикованому контексті. Відповідно наука, технології та інноваційна політика повинні стати більш відкритими та автономними, щоб система НТІ набула здатності до самореалізації, адаптації та інноватівності.

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***Ключові слова:*** наука, технології, інноваційна система, інтеграція

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## СМЕНА ПАРАДИГМЫ НАУЧНОЙ, ТЕХНОЛОГИЧЕСКОЙ И ИННОВАЦИОННОЙ ПОЛИТИКИ ВЬЕТНАМА В ПРОЦЕССЕ МЕЖДУНАРОДНОЙ ИНТЕГРАЦИИ

Во время каждого переломного момента мировой истории во Вьетнаме осуществлялись судьбоносные преобразования. В этом процессе изменения в экономической модели и социальных институтах страны происходят параллельно с изменениями в государственных управлении в конкретных сферах, особенно при переходе от централизованно планируемой к социалистической рыночной экономике. Система науки, технологий и инноваций Вьетнама (система НТИ) также пережила множество реформаций, во время которых она развивалась и побуждала свои составные элементы к положительным самоинновациям. Показатели науки, технологий и инноваций сегодня закладывают в стратегические цели национальной политики для каждой отрасли и каждого сектора (государственного и частного) страны, а также для всех частных лиц и организаций Вьетнама. В условиях международной экономической интеграции и четвертой промышленной революции наука, технологии и инновации более, чем когда-либо, выступают целями и средствами социально-экономического развития. В статье анализируются теоретические подходы к политике в сфере науки, технологий и управления инновациями во Вьетнаме, определяются достигнутые успехи и вызовы, которые возникают в контексте международной интеграции.

Рассматриваются концепции и подходы к исследованию политики и инноваций, поскольку в предыдущих исследованиях отечественные ученые не пришли относительно их к единому мнению и недостаточно полно их определили. Также проанализированы изменения в политике страны касательно науки, технологий и инноваций с целью исследовать, как трансформировались отношения между государством и системой науки, технологий и инноваций в течение различных периодов. Изменения в политике вызвали изменения в ресурсах, организационной структуре, оперативном смысле и взаимосвязи между элементами, а также относительно места каждого элемента в системе НТИ. Последнее подразумевает макро- и микрополитические решения по развитию во Вьетнаме системы НТИ в новом, потенциально прогрессивном, однако и более рискованном контексте. Согласно изложенному наука, технологии и инновационная политика должны стать более открытыми и автономными, чтобы система НТИ обрела способность к самореализации, адаптации и инновативности.

Публикация представляет исследовательские результаты проекта национального уровня в 2017–2019 гг. «Исследование инновационных возможностей вьетнамских предприятий в контексте текущей ситуации и политических рекомендаций» (Код: KX.01.25 / 16-20) в рамках Национальной ключевой научно-технологической программы на 2016–2020 годы «Исследование ключевых вопросов социальных и гуманитарных наук для социально-экономического развития, Вьетнам».

***Ключевые слова:*** наука, технологии, инновационная система, интеграция