第 48 卷 第 1 期
2021 年 1 月

湖南大学学报（自然科学版）
Journal of Hunan University (Natural Sciences)

Vol. 48. No. 1.
Jan. 2021

Open Access Article

The Role of Science and Technology in Growth Model Innovation in Vietnam (2010 – 2020)

Nguyen Van Hiep and Pham Ngoc Tram *

Thu Dau Mot University (TDMU), Binh Duong, Vietnam

Abstract: Science and technology play an important role in transforming growth models, improving productivity, quality, efficiency, and competitiveness of the economy. This is vital to the country's existence and development and is an urgent requirement of the current industrialization, modernization, and national integration in Vietnam. During more than 30 years of industrialization, modernization, and international integration, science and technology in Vietnam, especially in the last ten years (2010-2020), achieved important progress in all aspects, making a practical contribution to economic development, improved the quality of people's life and consolidated national defense and security. However, science and technology in Vietnam today still have many shortcomings as the level of science and technology of social production remains low and backward compared to other countries in the region; low labor productivity; domestic businesses are still less interested in investing in research and development (R&D); investment in science and technology activities is low, the structure is not suitable, efficiency is low; the contingent of science and technology staff lacks quantity, is weak in quality, and the structure is not suitable. These shortcomings have affected the demand for reform of an economic growth model to meet rapid and sustainable development requirements. Written focus on clarifying the role of science and technology in the innovation of growth model, thereby assessing the status of promoting the role of science and technology in innovating economic growth model in Vietnam. Especially in the period 2010 - 2020. Thereby, the article proposes several solutions to promote the role of science and technology in the innovation growth model in Vietnam.

Keywords: science, technology, economic growth model, Vietnam.

科技在越南增长模式创新中的作用（2010 年至 2020 年）

摘要：科学和技术在转变增长模式，提高生产率，质量，效率和经济竞争力方面发挥着重要作用。这对越南的生存和发展至关重要，也是越南目前的工业化，现代化和国家融合的迫切要求。在工业化，现代化和国际一体化的 30 多年中，越南的科学技术，特别是最近十年（2010-2020 年），在各个方面均取得了重要进展，为经济发展做出了实际贡献，提高了质量人民生活和巩固的国防与安全。但是，由于该地区其他国家的社会生产科学技术水平仍然很低和落后，今天的越南科学技术仍然存在许多不足。劳动生产率低；国内企业对研发投资的兴趣仍然较小；科技活动投资低，结构不适合，效率低；科技人员队伍缺乏，素质较弱，结构不适宜。这些缺点影响了对经济增长模式进行改革以满足快速和可持续发展要求的需求。书面重点放在阐明科学技术在增长模式创新中的作用，从而评估在越南促进科学技术在创新经济增长模式中的作用。特别是在 2010 年至 2020 年期间。因此，本文提出了几种解决方案，以促进科学技术在越南创新增长模式中的作用。

关键词：科学，技术，经济增长模型，越南。

Received: 13 October 2020 / Revised: 29 November 2020 / Accepted: 21 December 2020 / Published: 29 January 2021
About the authors: Nguyen Van Hiep and Pham Ngoc Tram, Thu Dau Mot University (TDMU), Binh Duong, Vietnam
Corresponding author Pham Ngoc Tram, trampn@tdmu.edu.vn

1. Introduction

In the early years of the twenty-first century, humanity witnessed and enjoyed many achievements due to the brilliant development of science and technology, especially the achievements of the industrial revolution 4.0 have changed all areas of social life. Science and technology have become the direct production force, a major driving force behind the socio-economic development of many countries worldwide. More importantly, it opens up a new economy, a new civilization for all humanity: intellectual economy and intellectual civilization. Therefore, currently, any country that perceives the role of science and technology in the socio-economy as focusing on adequate investment in science and technology development, knows that it will have conditions to quickly spurt in socio-economic development, soon joining the ranks of highly developed economies in the world.

Science and technology are the keys to transforming economic growth models from breadth to depth. Over the years, Vietnam's science and technology have shown this role quite well, but many problems need to be overcome. The paper analyzes the current situation and proposes many solutions to promote the role of science and technology in our country's economic growth model in the coming time.

2. Related Works

More than 180 years ago, Karl Marx said that science would become a direct production force. Karl Marx asserted: "The development of fixed capital is an indicator that popular social knowledge has transformed to some degree into a direct productive force" [1]. Marx also forecasted that, following the development of the great industry, the creation of real wealth becomes less dependent on labor time and the amount of labor cost; they depend on the general level of science and technical progress, or on its application in production.

A. Pierre analyzed and evaluated the scientific organization and the scientific research organization; the analyzed works contain the economic potential and the impact of science on the aspects of social life [2].

Alvin Toffler's conception of the role of science is the factor to diverge human history into different periods according to successive waves of civilization created by scientific and technological achievements. According to Toffler, knowledge is the power, the power of the future, the never-ending thing, it uses never-ending, and is the most democratic power [3]. At the same time, the current world's rapid changes are not chaotic and accidental but a process of transformation from civilization to civilization. Human history follows three waves of an agricultural, industrial and post-industrial civilization whose coordinates are attributed to science and technology [4].

Besides, it is possible to mention here that some recent forecasts were forecasted by the future related to the impact of science and technology. Konrad Seitz affirmed the role of science and technology as the power of countries to advance in the twentieth century [5]. Claude Allegre argued that the advances of science in the twenty-first century would be even greater than before, with the development of science changing daily life, upsetting people's understanding and belief [6].

Science and technology contribute to increased labor productivity, transforming economic growth models, people in many countries become rich, well-off, healthy, and live longer. However, all of these achievements have negative side effects [7].

The role of science and technology is to exercise the function of perception and transformation of the world. The last part of the work focuses on analyzing the role as the foundation and driving force of science and technology for the industrialization and modernization in Vietnam as a decisive role for equipping modern equipment for production, playing an important role in training and promoting human resources, perfecting mechanism, organizing production management, contributing importantly to the implementation of goals of sustainable development [8].

3. Research Methodology

Renovating the economic growth model is understood as changing the mode of economic growth towards modernization, applying technology to production. In Vietnam, the economic growth model innovation is considered as a strategy for economic development in the process of international integration, aiming at fast and sustainable development, reforming the growth model towards knowledge economy development and green growth, improving growth quality and competitiveness; science and technology, knowledge, high-quality human resources, and information must be the driving force, creating added value of goods and services.

According to the Oxford dictionary, “science is knowledge about the structure and behavior of the natural and physical world, based on facts that you can prove” and “science is a system for organizing the knowledge about a particular subject, especially one concerned with aspects of human behavior or society”. As stated by the Economic and Social Commission for Asia and the Pacific (ESCAP) [17], “technology is systematic knowledge of processes and techniques used to process materials and process information. Technology includes tools, skills and knowledge, methods and systems used to create goods and deliver services.”

Today, science and technology have become a direct production force, spreading strongly to all areas of social life, a key factor in sustainable development. As the growth of a great industry, wealth creation becomes less dependent on labor time and the amount of labor that has been wasted rather than on the actors engaged in motion during the time of labor and the actors themselves, in turn (their enormous efficiencies), are incompatible with the direct labor time required to produce them, rather, they depend on the general level of science and the progress of technology [1].

From the above viewpoint, science and technology are the keys to transforming the economic growth model from the model mainly based on capital, labor, and resources to the model mainly based on the total factor productivity (TFP). The role of science and technology in innovating the economic growth model can be identified as follows:

Firstly, science and technology are decisive factors for economic growth in the long run. There have been many studies by economists on the role of science and technology in economic growth. In the middle of the nineteenth century, Marx predicted for the industrial age that the creation of wealth did not depend mainly on labor time but rather on the technology of production. Robert Solow stated that all growth per capita, in the long run, is conditioned by the technological progress. As asserted by Kuznets, technology is the red thread throughout the process of sustainable economic growth. Samuelson commented that about one-third of the increase in output in the US is determined by the impact of capital and labor; the other two-thirds are a balance attributed to education, innovation, and economic efficiency by scale, scientific progress, and other factors.

Science and technology are the decisive factors for economic growth. In the long run, unlike inputs such as capital, labor and resources are limited, science and technology resources seem without limits. Because when giving capital, labor, and resources to other individuals to use, the owner cannot continue to use those resources (limited). Whereas with science and technology resources, when given to others to use, the owner still does not lose the right to use that resource, and the more people use it, the closer to zero the cost of creating that resource. Therefore, it can be understood that the resources of Science, Technology, and Innovation are limitless. Science and technology become the decisive factor for economic growth in the long run. It is the key to overcome the state of rest and escape the middle-income trap (but should not be understood as absolute, because science and technology resources are products of human brain activity in certain historical eras.

Secondly, science and technology are the keys to transforming the growth model from breadth to depth. Science and technology are means to improve the efficiency of using other resources. With natural resources: science and technology make discovering and exploiting easier, increasing efficiency, finding many new sources of energy to replace the traditional energy sources that are gradually being depleted. With labor resources: science and technology fundamentally changed the working method of humans, shifting from physical labor (manual, simple) to intellectual labor (skilled workers, labor complexity), helping to increase labor productivity many times. With capital resources: through the modernization of financial intermediaries, communication systems, especially the digital revolution, have made banking transactions fast, easy, convenient, safe, accurate, promote production and business activities. Thus, science and technology are the keys to transforming a growth model of breadth to depth.

Therefore, as determined in the socio-economic development strategy in the process of Vietnam's international integration, the task is to "strongly develop science and technology as a driving force to accelerate industrialization, modernization, and development of knowledge economy, contributing to a rapid increase in productivity, quality, efficiency, competitiveness of the economy, rapid and sustainable development of the country; increasing the contribution rate of the factor of combined productivity and growth" [11].

Based on the theoretical issues about the role of science and technology in growth model innovation, the paper's approach is based on international and domestic scholars' views to evaluate. The status of promoting the role of science and technology in growth models in Vietnam is assessed and described with objective data from the main published Vietnamese statistical sources. Simultaneously, the article also uses a combination of specific research methods such as historical, logical, comparison, analysis, synthesis, inductive and interpretation, and data synthesis to serve in research and article presentation.

4. Scope of Article Results

The paper examines the current state of the role of science and technology in economic growth model innovation in Vietnam in 2010 - 2020. The research results can be used to make policy recommendations to

promote the role of science and technology in Vietnam's growth model in the coming time.

Novelty/Originality: From the general theoretical issues about the role of science and technology in the innovation of growth model, the article has analyzed and evaluated the current role of science and technology in renovating the current economic growth model in Vietnam and giving some policy recommendations to promote the role of science and technology in innovating economic growth models in Vietnam in the coming time.

5. Research Results and Discussion

5.1. Achievements promoting the role of science and technology in reforming Vietnam's economic growth model

The faculty Over the past years, Vietnam has implemented many guidelines and policies to promote science and technology development, making significant progress in the global innovation index ranking. According to the World Intellectual Property Organization [18], Vietnam's global innovation index ranking continued to improve to 42/129 economy, up to three places compared to 2018, 17 levels compared to 2016, and 34 levels compared to 2012. This result puts Vietnam ranked first in low middle-income countries, ranking 3rd in ASEAN (after Singapore and Malaysia). In particular, there are two indexes related to inputs and outputs of science and technology that have made great leaps, namely: the total expenditure on research and development (R&D) increased fivefold, and the Index of Production products based on knowledge and technology increased by eight times as compared to 2018 [10].

The survey results of the Vietnam's Ministry of Science and Technology in 2018 showed that about 30% of enterprises had technology innovation activities, and about 4,000 creative start-ups were operating [13]. Particularly in the industry and trade, the proportion of enterprises participating in technology innovation is increasingly high. In 2017, 49.8% of the technology was renewed compared to the enterprise's internal data, 47.8% compared to the market, and 2.4% compared to the world. In the field of technological innovation, more than 80% of large enterprises participate in product or process innovation, nearly 50% expand the field of production for large business; and the corresponding figures are about 50% and 17-18% for small and medium enterprises. This proves that businesses are increasingly interested in R&D activities. A report by the World Bank in 2017 shows that Vietnamese businesses spend about 1.6% of their annual revenue on R&D. Many corporations set up an S&T development fund to promote science and technology activities [11].

In the past five years, the number of international publications in Vietnam increased rapidly (about 2.5 times), from 4,484 articles in 2015 to 11,061 articles in 2019, with an increased rate of 25.5% per year. The number of international articles published annually by Scopus also increased from 1,764 articles in 2009 to 8,243 articles in 2018.

The strong development of science and technology in Vietnam over the past years had a positive impact on the innovation of economic growth model, as shown through:

Firstly, science and technology have contributed to improving the efficiency of using other resources:

(i) The labor use efficiency. During 2006-2010, in Vietnam the labor productivity growth rate is 3.45% per year; increasing to 4.35% per year in 2011-2015 and to 5.75% per year in 2016-2019. Generally, in the ten years from 2007 to 2016, labor productivity in terms of purchasing power equivalent in 2011 (PPP 2011) increased by an average of 4.2% per year, being 1.5% higher than the average growth rate per year in Singapore; 1.9% higher than the same indicator for Malaysia; 2.5% higher than the same indicator for Thailand; 3.5% higher than the same indicator for Indonesia; 2.8% higher than the same indicator for Philippines [12].

(ii) The capital use efficiency. In 2006-2010, the ICOR of the economy was 6.96 times; during 2011 – 2015, it decreased by 6.25 times, and during 2016 – 2019, it was 6.17 times lower [13].

(iii) The efficiency of natural resource exploitation. In 2010-2018, the coal industry, due to research and investment in technological innovation, increased the average output by 9.4% per year. The rate of mechanical exploitation increased dramatically, from 3.3% in 2010 to 13.1% in 2018. Especially through the State-level Science and Technology Project: "Research and manufacture equipment and technology for the construction of wells and vertical good loading shafts for Nui Beo coal mines", for the first time, Vietnam approached and mastered the world's advanced technology, helping to increase proactivity, reduce consultancy and design costs by about 30% compared to foreign hiring costs; contribute to localization of two-thirds of the value, reduce equipment import costs by 17-20%.

Secondly, science and technology have promoted the transformation of the economic growth model towards increasing TFP-based growth, decreasing capital-and labor-based growth. Since 2011, Vietnam's TFP growth rate is much higher than that of previous years. On the contrary, the capital-and-labor growth rate decreased. Specifically, the TFP growth rate was 2.06% in 2011-2018, being nearly four times higher than that of the

2006-2010 period (0.54%); the capital growth rate decreased sharply from 13.3% in the 2006-2010 period to 7.97% in 2011-2018, and the labor growth rate decreased from 2.77% in the 2006-2010 period to 1.27% in 2011-2018.

The rapid growth of TFP in 2011-2018 prompted the growth model transformation for Vietnam, gradually reducing capital and labor dependence. In 2001-2010, Vietnam's contribution of capital and labor growth to GDP growth was 73.6%; in 2011-2015, it was reduced to 69.8%; during 2016-2019 it continued to decrease to 59.7%. The contribution of the TFP increase factor to GDP growth is increasing. Thus, in 2001-2010, this proportion was only 26.4%, in 2011-2015, it increased to 33.6% and in 2016-2019, it was 44.5%, which is quite far from the set target of 30-35%.

These measures bring into full play the strength of promoting, improving economic quality and growth, maintaining national defense and security, improving the quality of people's lives, creating a new position and force for Vietnam.

5.2. Limitations on the promotion of the role of science and technology in renewing Vietnam's economic growth model

Universities Science and technology in Vietnam have made great progress in recent years, positively contributing to the innovation of the economic growth model. However, in order to realize the 2021-2030 period target, which is shifting to a model of in-depth economic growth, Vietnam's science and technology are facing many difficulties and challenges:

Firstly, the level of science and technology of social production has been raised, but in general, it is still low, even out of date and slowly being reformed. Currently, most Vietnamese enterprises, especially private enterprises, are using technology that is 2-3 generations behind the world average, of which 76% of equipment, machinery, and technology lines was imported from abroad in the 1960s-1970s; 75% of the equipment is fully depreciated; 50% of equipment is refurbished [12]. Knowledge Economic Index (KEI) of Vietnam is 3.51, of which the innovation index is 2.72, much lower than the same of Singapore (8.44), Malaysia (6.07), and Thailand (5.52). According to the World Intellectual Property Organization (WIPO) [19], by 2018, the rate of Vietnamese patents and applications was improved significantly (ranked 51), higher than the same in the Philippines (ranked 55), and Bangladesh (ranked 102) but still much lower than in Singapore (25), Indonesia (35), Malaysia (38), and Thailand (40). These figures show that science and technology, especially high technology, have not played a key role in improving investment efficiency.

Secondly, labor productivity in Vietnam is low. Comparison of Vietnam's labor productivity with the least developed countries in Southeast Asia (CLMV - a block of four countries Vietnam, Laos, Cambodia, and Myanmar), ASEAN + 6, ASEAN shows that all countries see lagging. According to the Asian Productivity Organization [20], Vietnam's labor productivity is even lower than in Laos, Myanmar, and even lower than in CLMV. In 2018, Vietnam's labor productivity was only equal to 96% of Myanmar, 88.7% of Laos, 54.5% of the Philippines, 41% of Indonesia, 36% of Thailand, 18% of Malaysia, 35.4% of ASEAN + 6, 43.6 % of ASEAN and only equivalent to 7.7% of Singapore.

Analyzing the changing trend in labor productivity during 1970-2016, if the United States is taken as a standard, Vietnam's labor productivity has increased, but the growth rate is quite slow; at the same time, labor productivity of Singapore, Hong Kong, Malaysia, etc. increased dramatically (the slope of these countries is larger than that of Vietnam), showing the absolute gap in average income between Vietnam and some countries in the region.

Thirdly, domestic enterprises are still less interested in investing in research and development (R&D). The ratio of R&D spending to GDP in Vietnam (including the public and private sectors) is only about 0.44%, much lower than the world average making 2.23% of GDP. The linkage between enterprises and scientific research facilities to implement the process of technology transfer and innovation is still very limited. According to FIRST-NASA's recent research on enterprise innovation [21], only nearly 14% of businesses have coordinated with outside units to conduct product innovation research. Technology transfer activities from science and technology organizations to enterprises are very low (just under 1%). It can be said that the link between enterprises (the demand side in the science and technology market) with institutes, schools, scientists (the supply side) is still very limited.

Fourth, investment in science and technology is low, the structure is not suitable, and the use efficiency is low. The investment rate in science and technology from the state budget has gradually decreased from 2000 to the present. On average, the 2000-2010 period reached 1.85% per year of the total state budget expenditure.

During 2011-2018, this rate was only 1.4% per year. At the same time, the law requires to spend 2% of the state budget on science and technology. The ratio of R&D spending to GDP in Vietnam is very low compared to the world average. Vietnam's total expenditure for both public and private sectors for science and technology since 2010 has reached only 0.44% of GDP, much lower than the world average of 2.23% of GDP (Thailand 0.78%; Singapore 2.2%; Malaysia 1.3%, China 2.1%) [16]. The structure of investment capital in science and technology still has many shortcomings. In East Asian countries, the state budget capital for this activity only accounts for 20-30%, while that of the non-state sector is 70-80%. In OECD countries, this structure is close to 20% and above 80%.

Meanwhile, the structure of investment capital in science and technology in Vietnam in 2001-2010 was 70%/30%, in 2011-2015 it was 60%/40%, and in 2016-2019 it showed 52%/48%. The efficiency in using funding for science and technology activities is not good. Some localities have not used these funds for the right purposes, such as spending on the operation of the non-business units under the Department of Information and Communications; project reciprocal spending; expenses for wastewater treatment; expenses for construction of underground medium-voltage lines, transformer stations.

Fifth, the contingent of science and technology staff is insufficient in quantity, weak in quality, and the structure is not suitable. The rate of R&D staff per capita in Vietnam is relatively low and has hardly increased since 2013, reaching about 7.02% (only equal to 20% of the EU average, 7.6% of the same for South Korea, 29.8% for Malaysia, and 58% for Thailand). The proportion of university age (18-29 years) students attending university is 28.3%, among the lowest in the world. Meanwhile, this rate is 43% for Thailand, 48% for Malaysia, and even higher in developed countries [14].

Sixth, there is a lack of mechanisms and policies to favor and stimulate creativity for scientists and scientific establishments, so it has not created a driving force for developing and applying science and technology. Besides, awareness of all levels, sectors, and localities about the role of science, technology, and innovation is not comprehensive enough.

The above limitations and shortcomings show that science and technology have not performed well the role of really the leading national policy; act as the key and most important driving force to develop a modern production force, industrialize and modernize the country. The main reasons are:

1- All levels, sectors, businesses, and science and technology organizations are not fully aware of the role and position of science and technology for the country's rapid development and sustainability in the long term;

2- Vietnam develops in a broad-based growth model based on low-skilled labor, low-cost land and other resource-intensive technologies, mainly manufacturing raw products, processing and assembling for a long time; failing to create a large "demand side" (firstly by the enterprises) to encourage and promote the development and application of science and technology and innovation;

3- Institutions for development and application of science and technology and innovation still have many shortcomings and inconsistencies. There is a lack of mechanisms suitable to the specificity of intellectual activities to create a strong driving force for the development and application of science, technology and innovation;

4- The country's scientific and technological potential (the contingent of science and technology staff, intellectual property, financial resources, scientific and technological facilities) has been increased but still is very humble. These are also important issues to be overcome for promoting the role of science and technology in the innovation of growth models in Vietnam in the new period.

5.3. Some measures to be implemented to promote the role of science and technology in growth model innovation in Vietnam

The above analysis shows that to promote the role of science and technology in the growth model innovation in Vietnam in the coming time, the Government of Vietnam needs:

Firstly, to build a strong science and technology development strategy as a basis for improving productivity, quality, efficiency, and competitiveness of industries, sectors, and the whole economy, promote economic restructuring and economic growth model innovation, promote R&D innovative start-ups, application combined with technology development, especially in new fields and fields with potentials and strengths.

Secondly, to develop national science and technology toward enterprise-centered universities and research institutes as healthy research subjects. They are developing and implementing science and technology programs to support research institutes, universities and enterprises towards creating research results for intellectual property rights protection, which increases the use of intellectual property tools to develop key industries and fields, products and services with competitive advantages, to create source technologies and core technologies. Continue to implement the process of transforming S&T public institutions into enterprise models.

Thirdly, to renew and perfect mechanisms and policies to effectively mobilize, allocate, and use investment capital for science and technology activities. Continuing to improve the policy of State budget investment in science and technology activities in the direction of avoiding overlapping allocation and scattered investment and ensuring efficient use thereof; enhancing the roles and responsibilities of organizations in the management and use of state budget funds for science and technology, avoiding misuse, waste and loss; strengthen the inspection and supervision of scientific and technological research results; build a system of indicators to evaluate the completion and quality of the assigned tasks for science and technology units; to encourage enterprises to establish and scale-up science and technology development funds, promote and encourage the private sector and enterprises to invest heavily in science and technology.

Fourth, to strongly develop educated intellectual workforce, improve people's knowledge, train talents, concentrate on education development investment, accelerate training of scientific and technical staff and skilled workers, managers, people in the business. Education and training, science and technology should be considered the top national policy, a breakthrough to meet the demand for high-quality human resources for the knowledge economy. Opportunities should be created to improve skills, ensure work learning and lifelong learning for employees. Enterprises should be encouraged to participate more in national human resource development, especially state-owned enterprises and multinational corporations. The task includes also adopting policies to attract overseas Vietnamese and foreign experts for participation in scientific and technological activities in Vietnam.

Fifth, to promote international cooperation and integration, joint research cooperation to take advantage of resources and knowledge of advanced countries, and step by step raise the level of domestic research capacity and level to be able to participate in equal cooperation and mutual benefit in the long term. We are strongly supporting regional and international scientific exchanges and academic exchanges. We should develop and improve the operational efficiency of the network of Vietnamese science and technology representatives in foreign countries, especially in key areas, attracting and exploiting the strengths of the contingent of talented Vietnamese scientists abroad.

6. Conclusions

Nowadays, when humanity is entering the knowledge economy, science and technology become direct production forces. Science and technology not only improve human knowledge, help people perceive and grasp the nature and laws of the world, but also help people transform knowledge into technical means, ways to improve the world, effectively serving the socio-economic development of each country in general, and to economic growth model in particular.

In the process of international integration, science and technology in Vietnam play an important role in strongly developing production forces, reforming growth models, improving the quality of people's lives, and consolidating national defense and security. However, the reality of scientific and technological development shows that Vietnam's innovations still have many limitations and shortcomings, failing to become the most important driving force in the development process as science and technology of social production remain low; the application of science and technology to agricultural production has not been conducted synchronously; the proportion of businesses and R&D in all industries is still very low; there is low investment in science and technology activities; inadequate structure, low efficiency, etc. are hindering the reform of growth models in Vietnam today. It is necessary to synchronously implement the above solutions to promote the role of science and technology in the growth model innovation in Vietnam, contributing to rapidly increasing productivity, quality, efficiency and competitiveness of the economy, rapid and sustainable development of the country; and the factor contribution to aggregate productivity and growth.

References

[1] MARX K., & ENGELS F. *The entire episode*, ep. 46, part 2. Hanoi: National politics, 2015: 372–373; 213-214.

[2] PIERRE A. Tendances actuelles de la recherche scientifique". Pari: UNESCO, 1961.

[3] TOFFLER A. *Powershift*. Hanoi: Information theory, 1991.

[4] TOFFLER A. *The Third Wave*. Hanoi: Youth, 1992.

[5] SEITZ K. *Race into 21st century – the Future of Europe between America and Asia* Hanoi: National Politics, 2004.

[6] ALLEGRE C. *Science is the challenge of the 21st century. [La science est le défi du XXIème siècle]* Hanoi: Knowledge, 2013.

[7] TOWNSEND P. *The dark side of technology*. Hanoi: National Politics, 2018.

[8] PHAM T.N.T. *Science and technology with the*

perception of changing the world and people - A few theoretical and practical issues. Hanoi: Social Science, 2003.

[9] Communist Party of Vietnam. *Document of the 11th National Party Congress.* Hanoi: National Politics – Truth, 2011.

[10] QUYNH A. Vietnam on the way to innovate and create, 2019. Available at: http://ncif.gov.vn/Pages/NewsDetail.aspx?newid=

[11] TAN, V.H. Outstanding achievements and contributions of science and technology in the realization of the goals of the Industry and Trade sector, 2019. Available at: https: //www.moit.

[12] NGUYEN, B. L. Vietnam's labor productivity and key motivating solutions. Presentation at CEO Forum 2018, Hanoi, 2018.

[13] Vietnam Economic Times: *Economy 2018-2019, Vietnam and the World*. Hanoi: Finance Publishing House, 2019.

[14] TRAN H. The proportion of Vietnamese university students is among the lowest in the world, 2019. Available at: https://tuoitre.vn

[15] DAN C. In 2017, how did science and technology contribute to the country? 2019. Available at: https://dantri.com.vn/khoa-hoc-cong-nghe/nam-2017-khoa-hoc-va-cong-nghe-da-dong-gop-duoc-nhung-gi-cho-dat-nuoc-20180109093100359.htm

[16] HAI, V. Promoting the role of science and technology in rapid and sustainable development in Vietnam, 2020. Available at: http://www.tapchicongsan.org.vn

[17] ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC (ESCAP), n.d. https://www.unescap.org/

[18] WORLD INTELLECTUAL PROPERTY ORGANIZATION. Global Innovation Index (GII) 2019. https://www.wipo.int/global_innovation_index/en/2019/

[19] WORLD INTELLECTUAL PROPERTY ORGANIZATION. Global Innovation Index 2018. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2018.pdf

[20] ASIAN PRODUCTIVITY ORGANIZATION, n.d. https://www.apo-tokyo.org/

[21] NASA. Innovation, 2008. https://www.nasa.gov/50th/innovation/

参考文:

[1] MARX K.和 ENGELS F.整集，第。 46，第 2 部分。河内：《国家政治》， 2015 年：372–373； 213-214。

[2] PIERRE A.科学趋势。巴黎：联合国教科文组织，1961。

[3] TOFFLER A.换档。河内：信息论，1991。

[4] TOFFLER A. 第三波。河内：青年，1992。

[5] SEITZ K.进入 21 世纪-美国和亚洲之间的欧洲未来河内：国家政治，2004。

[6] ALLEGRE C. 科学是 21 世纪的挑战。 [XXIème 城堡的科学进展]河内：知识]，2013。

[7] TOWNSEND P。技术的阴暗面。河内：国家政治，2018。

[8] PHAM T.N.T.具有改变世界和人类观念的科学技术-一些理论和实践问题。河内：社会科学，2003。

[9] 越南共产党。十一届全国人大代表大会文件。河内：《国家政治-真相》， 2011。

[10] QUYNH A.越南，《创新与创造之路》， 2019。可在以下网站找到：http://ncif.gov.vn/Pages/NewsDetail.aspx?newid=

[11] TAN，V.H.，科学技术在实现工业和贸易领域目标方面的杰出成就和贡献，2019。网址：https：//www.moit。

[12] NGUYEN，B。L.越南的劳动生产率和主要激励措施。在 2018 年河内首席执行官论坛上的演讲。

[13] 越南经济时报：2018-2019 年经济，越南和世界。河内：金融出版社，2019。

[14] TRANH。越南大学生的比例是世界上最低的，2019 年。可在以下网址获得：https：//tuoitre.vn

[15] DAN C. 2017 年，科学技术对国家有何贡献？ 2019.可在以下网址获取：https：//dantri.com.vn/khoa-hoc-cong-nghe/nam-2017-khoa-hoc-va-cong-nghe-da-dong-gop-duoc-nhung-gi-cho -dat-nuoc-20180109093100359.htm

[16] HAI，V。在越南促进科学技术在快速和可持续发展中的作用，2020。网址：http：//www.tapchicongsan.org.vn。

[17] 亚洲及太平洋经济社会委员会（亚太经社会），n.d。https://www.unescap.org/

[18] 世界知识产权组织。2019 年全球创新指数（GII）. https：//www.wipo.int/global_innovation_index/en/2019/

[19] 世界知识产权组织。全球创新指数 2018. https：//www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2018.pdf

[20] 亚洲生产力组织，n.d。https://www.apo-tokyo.org/

[21] NASA 。创新，2008 。https：//www.nasa.gov/50th/innovation/