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Renewing the Model of Vietnam's Economic Growth Based On Science, Technology and Innovation in the Context of the Fourth Industrial Revolution

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Abstract: *The fourth industrial revolution has impacted powerfuly to science and technology, economic and social development. The stable economy depends on the level of national science and technology development. In Viet Nam, the transformation of a growth model based on the intensive use of natural resources into growth based on science, technology and innovation (STI) is an indispensable trend to overcome the middle income trap. This paper will clarify: (i) the content of the fourth industrial revolution (4.0), (ii) the relationship between STI and economic growth, (iii) the policy recommendations to reform Vietnam's economic growth model by appling STI in the context of the fourth industrial revolution.*

Keywords: Economic growth model, Fourth industrial revolution

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I. Overview Of Research

1.1. Industrial revolution

Industrial revolution is a revolution in the field of production a fundamental change in socio-economic, cultural and technical conditions. The production process consists of three basic elements: labor power, labor and labor materials. Where labor power is the total physical and mental capacity of the human being capable of being manipulated, used in the process of material production. Workers are the natural forces that affect people in the workplace. Labor material is the physical means that people use in the labor process to influence the labor object. The change of productive material in each stage of social development creates typical signs for a certain age of social production.

The first industrial revolution took place in the second half of the 18th century and the first half of the 19th century, marked by the invention of steam engines. The Second Industrial Revolution took place in the second half of the nineteenth century until the outbreak of the First World War. The decisive factor of this revolution was the development of the electricity industry, from the single sector to the mass production of electrically powered machinery. The third industrial revolution took place in the 1970s, called the digital revolution with the advent of automated production based on computers, electronics and the internet. On January 20, at the World Economic Forum (WEF), the concept of the fourth industrial revolution was formed, in which the dominant trend was a combination of real and virtual systems, Internet of Things (IOT) and Internet of Systems (IOS). The cornerstone of this revolution is the breakthrough of digital technology in the production of intelligence based on breakthrough achievements in the areas of information technology, biotechnology, nanotechnology.

1.2. Contents of the Fourth Industrial Revolution

The fourth technology revolution or Industry 4.0 has emerged technological breakthroughs in areas such as artificial intelligence, robotics, internet universes, self-driving, 3D printing, and nanotechnology. Artificial Intelligence (AI) is the intelligence represented by any artificial system. The term is often used to refer to computers that have a certain purpose and science that studies the theories and applications of artificial intelligence. The development of unmanned aerial vehicles, self-propelled cars, internet connections or interconnected to reduce the incidence of traffic accidents, the Hypeloop transport system has a higher speed up to 1,200 km/h, people connect to computers, homemade robots, virtual reality content, clothing that performs utopian skills, and supplements to support people with disabilities. New technologies change the way people live and interact.

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3D printing technology competes with injection molding technology, IC manufacturing and other manufacturing technologies such as 3D printing, replacing the classic manufacturing industry. With technological innovations, the 4D printing technology is emerging, the cyber technologies used in micro-assemblies and biotech printing have begun to grow in laboratories around the globe. Nanotechnology is a technology related to the design, analysis, fabrication and application of structures, devices and systems by manipulating shapes and sizes on a nanometer scale. Nanotechnology allows the manipulation and use of materials at the molecular level, enhancing and creating the special properties of materials, reducing the size of devices and systems to extremely small dimensions. Nanotechnology helps to replace polluting traditional chemicals, materials and production processes with a new, lightweight, energy-saving process that reduces the impact on the environment. Nanotechnology is seen as an industrial revolution that promotes growth in all areas, particularly biomedical, energy, environmental, information technology, and military.

The Fourth Industrial Revolution has had an impact on all aspects of society, from changes in economics, employment, the nature of work, products, forms of production, business in the digital age, The interaction between government and people, a model of economic growth of a country.

1.3. The concept of innovation

Innovation was first introduced by Schumpeter (1934), where innovation was the introduction of new products, processes, methods or systems to businesses, including the creation of markets, new forms of industrial organization. According to Thompson (1967), innovation is the creation, acceptance and implementation of new ideas, processes, and services. Wolfe (1994) argues that innovation is an important process that underpins the creation of different competencies or creates sustainable competitive advantage. Innovation is an organizational phenomenon that has been studied very early and has also been studied in a variety of fields (Quintane et al., 2011).

Although there are many views on innovation, in theory the innovation system can be divided into three levels: the national innovation system, the regional innovation system and the innovation system. The National Innovation System (NIS) was classified broadly and narrowly by Lundvall (1992) or in two respects as the cornerstone of national culture and political institutions. In broad terms, all the elements and interactions that interact in the creation, dissemination, and use of economically beneficial knowledge belong to the national innovation system. In a narrow sense, the national innovation system consists of institutions and institutions involved in exploration and discovery such as R & D organizations, R & D institutions, and universities. The process of national technology innovation often goes through the following steps: technology integration to meet minimum needs; Organize economic infrastructure at a minimum to receive imported technology; Create technology resources from overseas through product assembly; Technology development through purchase of licenses; Adapting, improving import technology; Technology innovation through research and development R & D; Asserted its position in the world technology market based on high investment in basic research (Khalil, 2002).

The Sectoral Innovation System (SIS), according to Doloreux and Parto (2005), is a mix of interests between the public and the private sector, formal institutions, and other organizations. Organizational and institutional functions and relationships that shape the creation, use, and dissemination of knowledge. The aggregation of actors creates spillover effects and the system encourages entrepreneurship to be formed from relationships, norms, values, and social interactions within the community for capacity building innovation and competitiveness of the region.

The Regional Innovation System (RIS) is made up of three elements: knowledge and technology, actors and networks, and institutions. Knowledge and technology define the scope of the industry innovation system. Entities and networks are individuals, enterprises, state or semi-state organizations that perform interactions through both market and non-market relationships. Institutions in the sector / sector will create a policy environment to foster innovation in the sector and sector (Schrempf et al., 2013). In Vietnam, the concept of innovation is first introduced into the Law on Science and Technology in 2013. Accordingly, innovation is the creation, application of achievements, technical solutions, technology, solutions. Management measures to improve the efficiency of socio-economic development, raising the productivity, quality and added value of products and goods. Innovative activities are of interest to policymakers to achieve their socio-economic development goals. State policies are important to innovation. In particular, the state should be responsible for planning, organizing and implementing related policies to support technology innovation enterprises and technology development and innovation policy models.

1.4. Theories of economic growth model

Economic model is a way of expressing the paths, forms and contents of economic development of nations through variables and economic factors in close relation to political, society. Models can be expressed in the form of text, graphs, graphs or mathematical equations. The economic growth of a country depends on

economic growth resources including human capital, capital accumulation, natural resources and technological knowledge.

The classic theory of Adam Smith (1723-1790) provides the basis of economic growth, land, labor and capital. Of the three above, land is the most important factor, the limit of growth. The activity of economic actors is governed by the invisible hand-market mechanism, which denies the role of the state, arguing that this is an impediment to economic development. The traditional growth theory of Karl Marx (1818 - 1883) mentions the factors that affect economic growth: land, labor, capital, technical progress. In the process of analyzing the business cycle and the economic crisis of capitalism, Marx argues that the crisis is due to the lack of demand, which is a sign of reduced wages and personal consumption. The capitalist also suffers from the desire to increase accumulation. Want to get out of the crisis, the state must take measures to stimulate the economy. Thus, Marx laid the foundation for defining the role of the state in regulating economic supply and demand.

In the late 19th century, with the advancement of science and technology, neoclassical economics was born. Strumpeter (1911 - 1939) is a pioneer in the model of economic growth. He argues that economic growth manifests itself in the gradual and progressive change of the economic system due to exogenous factors and economic development due to continuous internal changes created by change. New creativity. Self-investment is associated with innovation, not to be confused with innovation. Innovation is manifested by new combinations of production methods, goods, outputs, raw materials and the way in which production is organized. The model of competitive economic growth through innovation and the importance of education in ensuring economic growth has been demonstrated by him. Later on, Aghion et al. (2005, 2009) studied empirically the theory of Strumpeter

The long-term relationship between economic growth and innovation is pointed out by Solow (1956), in addition to capital and labor, that technical progress plays a decisive role in boosting economic growth. However, he regards technical progress, technology as an exogenous factor, economic growth totally dependent on technological shocks from outside, so it does not explain the economies of the same level. Technology but has different growth. Nadiri (1993) uses the Cobb-Douglas function to clarify the link between innovation, productivity and productivity. From this neoclassical growth model, economic growth is influenced by the growth rate of innovation and considered exogenous. Endogenous economic growth models align with the view of modern economic school, modeling technological advances, explaining the process of cumulative technological progress directly through the accumulation of funds. Human and indirectly through research and development.

II. The Relationship Between Innovation And Economic Growth

2.1. The role of innovation in economic growth

Innovative innovation has the role of helping underdeveloped countries overcome the poverty trap, middle-income countries beyond the middle income trap. Gill & Kharas (2007), Woo (2009) argue that in order to escape the middle-income trap and economic growth, developing countries need to change their economic structure from resource-based growth. Cheap to growth based on high productivity and innovation. If the country continues to maintain the model of economic growth based on the growth of social investment, low investment efficiency, backward science and technology and slow innovation. It is very difficult to escape the middle income trap (Ohno, 2009).

For developed countries such as Sweden and Ireland, Pessoa (2007) examines the relationship between innovation and economic growth. It has been pointed out that there is no strong link between research and innovation indicators for economic growth. Due to the complexity of the economic growth process, innovation policy should include other indicators besides cost indexes for research and innovation.

The innovation process is quantified as the number of patents, the number of brands, the cost of research and development (Aghion et al., 2010). Developing countries at an early stage are often encouraged to adopt petit patents and regular invention patents. Some countries, such as China, Japan, Korea and Thailand, have successfully caught up with their predecessors (Kim, Mani and Mu, 2012), helping The products, technologies, management methods of developed countries, penetrate into new markets, expand and consolidate their position in these markets (Lee and Mathews, 2015).

2.2. How the impact of innovation on economic growth

There are many studies on the impact of research and development (R & D) on economic activity. MOSTI (2014) argues that research and development creates technological innovation, enhances knowledge, and enhances the quality of human capital, resulting in higher productivity and sustainable economic growth in the long run. In addition to encouraging innovation, research and development also accelerates technology transfer and improves enterprise capacity through learning about advances in technology leadership (Griffith et al., 2001). Toshihiko Mukoyama (2002), Scotchmer (1991), Merges and Nelson (1994) point out that only precedent countries create new innovations with breakthrough technologies. Next-generation countries must

learn technologies that have been accumulating from earlier countries by imitating, imitating, and inventing their own technology. By learning, imitation technology is available, the following countries can accelerate, catch up with the advance.

Intellectual property rights, an element of innovation, affect growth because it either encourages or is a barrier to innovation. There are mixed views on the relationship between intellectual property and economic growth to achieve a balance between the creation of knowledge (protection of inventors) and access to knowledge (Restricting and increasing the burden on backward businesses, mainly small and medium enterprises, because of the disadvantage compared to their predecessors in innovation). According to Fink and Maskus (2004), the impact of intellectual property rights on economic growth depends on many factors and changes in each country and each stage of development. In contrast, many studies examine the impact of economic growth on research and development. According to Bozkurt (2015), there is only a one-way effect from economic growth to research and development but there is no reverse effect. In line with this view, Shah (2004) argues that in developed countries, economic development leads to the development of science, technology and research and development. From the above studies, the contribution of innovation to growth is not the same in countries where each country has a different policy system that promotes growth based on innovation.

In Vietnam, the issue of economic growth based on science and technology has been clearly mentioned in the guidelines and policies of the State. Although there are policies that promote economic growth, in reality the role of innovation in Vietnam's growth is limited, largely dependent on investment, capital. According to the WEF, Vietnam has consistently ranked only in the Group of countries in stage 1 (the lowest among 5 groups) with development motivation based mainly on the factors of production (capital, labor, resources). So far, no research has systematically studied science and technology development policies, policies aimed at enhancing the position of science and technology for growth and especially the impact assessment of policies on economic growth in Vietnam based on science, technology and innovation at national, regional and sectoral levels as well as the successes and limitations of current policies in promoting economic growth based on science, technology and innovation in Vietnam.

The process of building and developing a model of economic growth based on science and technology and innovation has many different approaches. From the point of view of the innovation system, the process of building and developing Vietnam's growth model both impacts on the economic growth pattern of each region, as well as the growth pattern of each economic sector and vice versa. At the national level, there is a need for common policies and solutions to implement the model. At the regional level, as each region has its own socio-economic characteristics, it is necessary to have policy and solutions to implement the model in accordance with the national policy system. Each region has its own advantages and advantages. At the sectoral level, as each sector has its own characteristics, its own competitive environment, each sector of economic development is always based on a science and technology, so it is necessary to have policies and construction solutions. Growth pattern in terms of economic sectors in three levels. Economic growth based on innovation at the national level, economic growth based on regional level innovation, and economic growth based on innovation at the sector and enterprise level. At each level, the model of economic growth based on innovation is established on the basis of an overview of the relationships between science, technology, technology transfer, innovation and economic growth.

Overview of the results of foreign research, the model of economic growth based on science, technology, innovation are introduced through three main mechanisms. They are developing new products and new industries; accelerating the process of creating and attracting enterprises; promoting the formation of a chain of technology and innovation systems in the region. To build a model of growth based on science and technology and innovation is to promote and strengthen the linkage between the actors in the chain, including universities/The scientific and technological office conducts scientific research and scientific and technological services. Enterprises are units that can carry out research and development activities as well as receiving units in technology transfer activities and application of technological products to production and business activities (Mostly enterprises are operating in industrial parks, hi-tech parks and start-up companies). State management agencies are policy-making units that include policies related to science and technology development and innovation.

III. Conclusions And Recommendations

The economic growth model based on science, technology and innovation (STI) helps scientists, managers and policymakers better understand the role of STIs in the competitiveness of the economy. This takes them for paying more attention to the STI, invest more in the STI and see STI as a driver of long-term economic growth in Vietnam.

To develop economy based on SIT, Vietnam’s goverment should promote public-private partnership in innovative activities. This is one of the content that has been reflected in the policies of Vietnam. Therefore, in

order to develop the economy based on science, technology and innovation, the Government should continue to implement effectively: The Party Central Committee adopts sixth session's resolution on science and technology development; Strategy for development of science and technology to 2020 (Decision No 418/ QD-TTg dated 11/4/2012 of the Prime Minister); Project on international integration of science and technology to the year 2020 (Decision No. 735/QD-TTg dated 18/5/2011 of the Prime Minister); The bilateral and multilateral scientific and technological research cooperation program to 2020 (Decision No. 538 /QD-TTg dated 16/42014 of the Prime Minister); Public-private partnership pilot Scheme, co-financing the implementation of scientific and technological tasks (Decision No 1931/QD-TTg dated 7/10/2016 of the Prime Minister); Decision No. 592/QĐ-TTg dated 22/5/2012 on the program on supporting the development of science and technology enterprises and science and technology organizations implementing the mechanism of autonomy and self-responsibility; Decision No.844/QD-TTg dated 18/5/2016 on the Scheme on support for the national innovation innovation system until 2025; Decision No.1062/QD-TTg dated June 14, 2016 on the intellectual property development program until 2020; Decision No. 677 / QD-TTg dated 10/5/2011 of the Prime Minister approving the National Technology Innovation Program until 2020; Decision No. 2075/QD-TTg dated 8/11/2013 of the Prime Minister approving the program on development of science and technology market utill 2020.

Moreover, when studying the experiences of selected countries gives practical lessons from the success and limitations of the innovation model of growth based on STI, then helps professionals, managers and policymakers in Vietnam avoid the factors that negatively affect the model of economic growth and promoting the factors that have a positive influence. The assessment of the status of economic growth based on STI in Vietnam support researchers/experts, policymakers, managers at all levels and businesses see issues that limitted growth, factors influenced the promotion of economic growth, thereby finding the cause and proposing appropriate policies. This has provided a scientific basis to guide the identification of the STI-based growth model suitable for Vietnam in the context of the Fourth Industrial Revolution.

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