DEFENSE INDUSTRIAL COMPLEX FOR DEVELOPMENT OF THE NATIONAL INNOVATION SYSTEM

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***Summary**:*

Defense-industrial complex (DIC) refers to the partnership between defense enterprises and institutions of national innovation system for research, development and production of weapon systems, military products and materials. DIC plays an essential role in improving the autonomous capability of national defense industry, contributing to national security and promoting the development of commercial industries and national innovation system. This paper analyses the DIC's role for different countries, the relationship between DIC and national innovation system; making recommendations for policy development of DIC in Vietnam.

***Keywords**: Innovation; Defense industrial; Socioeconomic.*

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1. The defense industrial complex and debates about its role in national socio-economic development

The development of industrial revolutions, as well as military conflicts and wars led to the birth of an organizational form, mobilizing resources in the field of defense industry, with the name "defense industrial complex". In international documents, some documents use the phrase "Military-Industrial Complex"; other documents use the phrase "Defense-Industrial Complex". Although the words "military" and "defense" have different meanings, this article argues that when combined with the word "industrial", the two phrases "military-industrial complex" and "defense-industrial complex" has no significant difference. National defense industry is a part of national industry[2]; and therefore, the subject of defense industry also belongs to one of the subjects of national industry. This article will use the common phrase "Defense Industrial Complex" for both of the above-mentioned phrases with the meaning that defense industry is a part of the national industry and do not use the phrase "military-industrial complex" which is still controversial today.

Here, a question arises: What is DIC? Nzeribe & Imam (2018) argue that the DIC is an informal alliance between the national military and the defense

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[2] Article 12, National Defense Law stipulates: *National defense and security industry is a part of national industry, an important part of national defense and security strength and potential*.

industry. These authors also believe that the driving factor behind the relationship between the government and the DIC is the benefit of both sides: one side receives military weapons and technical equipment, and the other side receives payment from the provision of military weapons and technical equipment. Close to the views of Nzeribe & Imam (2018), Smart (2016) emphasizes the benefits of the parties when stating that DIC is used to refer to forms of benefits that lead to increasingly close links between commercial businesses and military circles. Another concept of DIC given quite specifically by Weber (2018) is that the system includes a defense industrial base linking industries involved in the production of weapons and military materials. Dunne & Skons (2009) said that the core of the DIC is the existence of a strong defense industrial base, linking interests around it, including all kinds of interests and institutional links in society. Another concept of DIC by Byrne (2017) is a political-economic system that maintains profits in providing products and services to the military industry. Byrne also believes that the DIC includes organizations that are both cooperative and competitive, remaining as a unified entity for the benefit of all participating parties. Another way of looking at the DIC is to see it as an overarching concept or representative of the entire national defense industry. In its study of the (former) Soviet Union's DIC, OECD (1995) commented: "During the Cold War, the Soviet Union maintained a DIC, including 1,200 industrial enterprises and 970 research organizations and design offices. The total number of employees of DIC is estimated at 12-14 million people". Agreeing with this OECD concept on DIC, there are also some authors such as Shlykov (1995), Menshchikov (2007). According to this understanding, DIC is considered as a comprehensive system of political, defense - security, economic, industrial, science and technology elements of a country to develop defense industry. With this understanding, each country only has one DIC, for example, the United States DIC, the Russian Federation's DIC, the Vietnam DIC,...

However, another school of research on defense industry believes that DIC is a link, but not of "all" defense industry establishments in a country, but only one or a few defense industry establishments as discussed above in previous part. Based on a summary of some concepts of DIC in the world, this article proposes an understanding of DIC as a system of links and cooperation of defense enterprises with other organizations and businesses inside and outside the military to research, develop, and produce weapons and military technical equipment. Regardless of the state management agencies (the area that provides the institutional and policy environment for DIC), to some extent, DIC can be considered an economic group - in the sense that is an interconnected system of a number of businesses and organizations that is not controlled by one company. In other words, DIC is considered as an economic group, not formed according to the model of a parent company with subsidiaries and branches *(OECD, 2014)*.

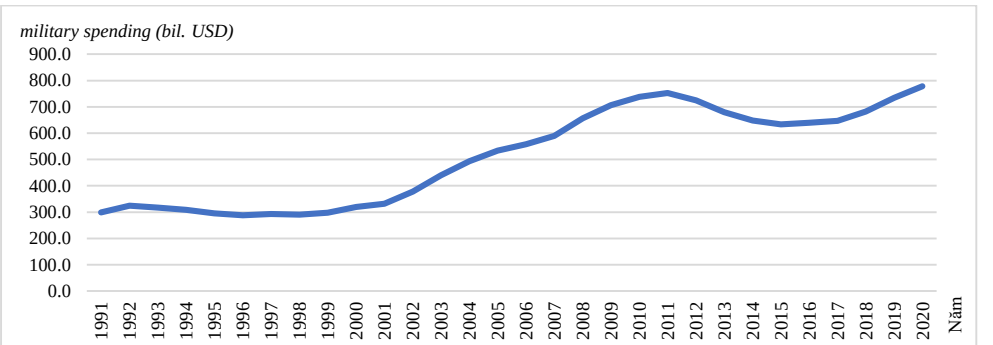
This explained why many scholars researching defense industry in the world, when providing case studies of DIC, often use examples of defense industry corporations (for example, Gansler, 2007; Cheung et al. al., 2017; Gregova et al., 2021). The above definition can also considered DIC as an innovation ecosystem (defined as an interconnected network of organizations, revolving around a core enterprise or a platform that aims to create new value through innovation *(Erkko & Llewellyn, 2014)* in the field of military and defense.

The first theoretical basis for DIC was given by Mills (1956) in his work titled "The Power Elite", when he analyzed the intertwined interests of military and business leaders. business and political elements in society such as the US Department of Defense and businesses that benefit from defense procurement. However, the term DIC only became famous when US President Dwight D. Eisenhower mentioned it in his end-of-term speech on January 17th, 1961, warning of the undesirable effects of DIC: "The potential for the disastrous rise of misplaced power exists and will persist[3]". Since President Eisenhower's Speech until now, there have always been two (02) main streams of opinion, debating the role of the DIC in socio-economic development, especially the role of the United States DIC, including: opinions opposing and supporting the development of DIC.

Regarding objections, according to Gibbs (1991), national governments spend military money in the national interest and to prevent threats to national security. Meanwhile, defense industry corporations define "threats" based on their position in capitalist production, identifying "threats" that affect their ability to maximize profits and maintain their share in the market. Consistent with this opinion, Cox (2014) pointed out that, after the terrorist attacks on September 11th, 2001, US military spending increased rapidly, serving the wars in Iraq and Afghanistan. In fact, US military spending decreased for a number of years after the Cold War (1991); and increased[4] rapidly after the terrorist attacks on September 11th, 2001 (Figure 1). However, also according to Figure 1, US military spending increased and peaked in 2011, then tended to decrease and increase again in recent years. Therefore, using data on national military spending to argue against the existence of DIC may not be a truly convincing argument.

[3] President Dwight D. Eisenhower's Farewell Addresss (1961), January 17, 1961, https://www.ourdocuments.gov/doc.php?flash=false&doc=90.

[4] Stockholm International Peace Research Institute (2021). SIPRI Military Expenditure Database, https://www.sipri.org/databases/milex.



Source: SIPRI (2021)

Figure 1. US military spending 1991-2020 (billion USD)

Opinions opposing the existence of the DIC said that group interests in the DIC and competition for resources create internal pressure on national military spending; Meanwhile, external threats are often exaggerated to strengthen the argument for increased military spending *(Dunne & Skons, 2009)*. Authors following this school of thought believe that the DIC creates an unnecessary burden on society and has a negative impact on the civil sector. Some neoclassical economists argue that the existence of DIC is something unusual and that governments allocate military budgets to address emotional threat and exaggeration *(Dunne & Coulomb, 2009)*; and authors of this school argue that there is a policy trade-off between "guns" and "butter". Also following this line of opinion, Nzeribe & Imam (2018) described US DIC as a catalyst for wars and military conflicts around the world. Thereby, the authors recommend that US elites need to heed President Eisenhower's warning; should spend more money on education, health care, housing, and the environment; Countries need to cut military spending, not throw money into the hands of defense industrialists.

Regarding supportive opinions, this stream of opinions believes that defense industry in general and DIC in particular do not create a burden for society, they contribute to promoting innovation and economic development. The European Commission did not directly give an opinion in support of the DIC, but indirectly affirmed the Commission's opinion on the Defense Industry. It is a strategic industry of the European economy, it not only contributes to ensuring security for the European Union but also creates jobs, added value, exports, contributes to regional development, especially promote the development of other industries through innovation *(EC, 2009)*. In fact, the warnings about the dangers of DIC that the US President issued in 1961 did not really take place, at least in terms of resource disputes with the civilian sector. During the Eisenhower era, in 1961, total US military spending reached 8.8% of GDP, in 2010 this number decreased to 4.7% of GDP; In the last 5 years, total US military spending has fluctuated at 3.2-3.8% of GDP *(WB, 2020)*. This level of US military spending decreased (as a percentage of GDP) significantly compared to the Eisenhower era.

DIC plays a particularly important role in many countries around the world. President of the Russian Federation, Vladimir Putin, said that modernizing the DIC means modernizing all industries of the Russian Federation *(Adamsky, 2014)*. President Vladimir Putin's statement shows the importance of DIC to the Russian economy. Akimkina et al. (2021) said that DIC is an important source of technology transfer for the civilian sector. These authors also believe that an effective technology transfer mechanism from the DIC is one of the key elements to building a competitive economy in the Russian Federation. In the case study of Turkey, Tresno & Agung (2020) identified four actors in the DIC, including: the government, the industrial sector, the military sector, and the research sector. These authors also affirmed that the combined efforts of the parties involved in the DIC helped Turkey achieve great achievements in developing the defense industry, achieve the goal of complete independence in the defense industry by 2023.

In summary, the two streams of opinion on the DIC discussed above show that the opposing opinions focus mainly on the US DIC; and believes that the existence and development of DIC is a burden on society, a catalyst for war and conflict in the world. Opinions supporting DIC say that DIC actively participates in growth, economic development, and technology diffusion; contribute to solving many social problems. The next content of this article will discuss the relationship between DIC and national innovation systems in the world.

2. Defense industrial complex and national innovation system

The concept of DIC contains many characteristics of the national innovation system - defined as an interactive network of institutions in both the private and public sectors whose interactive activities produce, import, change and spread new technology *(Freeman, 1987)*. In particular, the focus of the national innovation system analyzed by Freeman is the overarching interaction between technology, social characteristics, economic growth, and system feedback. The following contents of this section will specifically discuss the relationship between the DIC and the national innovation system.

First of all, it can be affirmed that the DIC is an important part of the National Innovation System. As above, it has been determined that the DIC is an innovation ecosystem in the field of military and national defense; it is a part of the National Innovation System. Observation of the participants in the National Innovation System and the DIC shows that: the main entities participating in the DIC (enterprises: including defense and civil defense enterprises), state management agencies and organizations in the research sector, are also the organizations participating in the National Innovation System. According to OECD (1997), one of the most important links in the National Innovation System is the link between three areas: state management - industry - research (Triple Helix). This is also the key link in DIC, according to the concept of DIC

presented above. In addition, the National Innovation System emphasizes the interaction of businesses in general with other institutions and organizations in the production, diffusion and use of new knowledge; Meanwhile, the DIC focuses on the interaction of defense enterprises with other institutions and organizations to create new value in military and defense through innovation.

The important thing to determine here is the core organization in the DIC - the defense enterprise, is also an organization of the national industry (the Defense Industry is a part of the national industry[5]). Or in other words, DIC needs to be considered a part of the national innovation system like civil industrial complexes. The opinions supporting the development of DIC analyzed above show that DIC contributes to promoting technology transfer and modernizing civilian industries; promote innovation and contribute to economic growth. Therefore, the DIC is an important part of the National Innovation System in the field of military and national defense. Some researchers, for example, Judith (2000) believe that the DIC is a part and plays a very important and leading role in the National Innovation System in the United States, the Russian Federation, China, the European Union, and some other countries.

Table 1. Group of 10 leading defense enterprises in the world (million USD)

No	Enterprise	Country	DR[6]	TR[7]	DR/TR (%)
1	Lockheed Martin	US	60 340	67 044	90
2	Raytheon Technologies	US	41 850	64 388	65
3	Boeing	US	33 420	62 286	54
4	Northrop Grumman	US	29 880	35 667	84
5	General Dynamics	US	26 390	38 469	69
6	BAE Systems	Britain	26 020	26 851	97
7	NORINCO	China	21 570	81 607	26
8	AVIC	China	20 110	80 446	25
9	CASC	China	19 100	43 408	44
10	CETC	China	14 990	55 443	27

Source: SIPRI (2022)

Second, DIC plays an important role in linking defense industry with civil industry. The nature of the DIC is the cooperation and association of organizations inside and outside the military to serve the development of defense industry. It has a much stronger role in connecting with the civilian sector than

[5] Not only Vietnam's National Defense Law identifies defense industry as a part of national industry. Many other countries (see Law on Defense Industry in Indonesia, Law on Defense Industry in Turkey, Law on Development of Defense Industry in Taiwan, etc.) all identify defense industry as a national industry.

[6] DR = Defense revenue.

[7] TR = Total revenue.

defense enterprises operating alone, in a closed or nearly closed process. The impact of linking defense industry with the civilian industry of DIC is reflected in the production value of civilian products and dual-use products of DIC.

Analysis of the revenue of the world's leading defense enterprises (which are also the foundations or core enterprises of the world's DIC) shows that: in the group of 10 leading defense enterprises in the world, six (06) the world's leading defense enterprises of the United States and the United Kingdom with mainly defense revenue; and the next four (04) Chinese defense enterprises have revenue mainly from civilian products (Table 1). The small revenue contribution of US DIC in the civilian industry can be seen as one of the basic reasons leading to the criticism of many scholars around the world about the harmful effects of DIC. Meanwhile, China's DIC is considered a successful example of the connection between defense industry and civilian industry, bringing benefits to society. The authors of this article also reviewed the list of 100 the world leading defense enterprises in 2021 and found: nearly 50% of enterprises have revenue from the civilian industrial sector greater than defense revenue *(see SIPRI, 2022).*

The revenue of the group of 100 world leading defense enterprises *(SIPRI, 2022)* shows that income from civilian products plays a huge role in the survival and development of DIC, especially DIC in developing economies. According to military spending data of countries in 2021, the average world military spending accounts for about 1.87% of global GDP. Thus, only a few countries such as the United States (3.48% of GDP), the Russian Federation (4.08% of GDP), the United Kingdom (2.7% of GDP) and a few other countries, state budget for the national military can meet the survival and development needs of domestic DIC. In other countries, if they do not develop the production of civilian products, it will be difficult for them to survive and develop. Even in China, a country with the second largest in the world military spending from state budget, the production value of military products only accounts for about 30% of the total revenue of Chinese defense industry corporations *(Wang et al., 2019)*.

The policy of linking defense industry with civilian industry is encouraged in many countries around the world, including the United States[8]. In particular, China has made military-civilian integration a national strategy. The 3rd Conference of the Central Committee of the Communist Party of China (XVIII Congress) in 2013 passed a number of documents related to the development of defense industry such as: The 13th Five-Year Plan on science and technology and defense industry; promoting civil-military integration (CMI); Science and technology development plan until 2025 *(Cheung et al., 2017)*. China's policy of promoting CMI became a national strategy in 2015. State Administration for Science, Technology, and Industry for National Defense (SASTIND) under the

[8] See the Defense Production Act of 1950 (amended and supplemented in 2018) of the United States; Indonesia's Defense Industry Law of 2012; and Turkey's Defense Industry Law.

Ministry of Industry and Information Technology of China is responsible for implementing the CMI Strategy. Also, according to Cheung et al. (2017), China's policy of promoting CMI includes allowing private participation in defense industry development; and China Shipbuilding Industry Corporation (CSIC[9]) was the first enterprise to receive private investment in the production of naval ships in November 2013.

Third, the DIC plays an important role, leading research and development (R&D) and technology transfer in the National Innovation System. In OECD countries, businesses account for over 70% of total social investment in R&D *(OECD, 2019)*; and the world's 1,000 leading innovation enterprises account for over 50% of total social investment in R&D (Strategy and PWC, 2018). The world's leading defense enterprises *(SIPRI, 2022)* are also the world's leading R&D investors because R&D plays a key role in creating core technology and background technology for production of high-tech weapons and technical equipment systems. In addition, unlike civilian enterprises, DIC also receives great attention from national governments due to its involvement in national defense and security. For example, in the United States, although business investment in R&D is nearly 3 times larger than state investment in R&D, for defense R&D, state investment still accounts for about 50% of total investment in defense R&D *(CRS, 2021)*. The CRS (2021) report also shows the rise of Chinese defense R&D, focusing on developing a number of dual-use technologies, including: artificial intelligence (AI), self-control system, human robotics, nanotechnology, augmented reality/virtual reality (AR/VR). For the Russian Federation, Rostec DIC, of the total budget equivalent to about 7% of Rostec's revenue invested in R&D in 2017, Rostec spent about 2.5% of revenue, the remaining budget was equivalent to 4.5% of revenue is state investment through national R&D programs *(Rostec, 2017)*. Thus, in addition to the investment of DIC in R&D, there is also a combination of state resources invested in defense R&D. This explains why DIC are playing a leading role in many high-tech fields. Several technologies such as Internet, CLONASS, GPS, jet engines, fiber optic cables, computers, nuclear energy, and many other background technologies are being widely used in the world in both civil and defense sectors, all come from defense enterprises *(Akimkina, 2021; Barcellos, 2022).*

3. Some issues about building and developing the defense industrial complex in Vietnam

First, a question is whether Vietnam really must build and develop a DIC or not. From international experience, Tresno & Agung (2020) said that the US imposition of a weapon embargo on Turkey in 1975 due to the war with Cyprus in 1974 awakened Turkey to reduce its dependence on the import of weapons.

[9] In 2021, China's two largest shipbuilding enterprises, CSIC and CSSC, merged into one enterprise under the name CSSC - the enterprise ranked 14th in SIPRI's list of the world's top 100 defense enterprises *(SIPRI, 2022).*

Recent wars/military conflicts in the world such as the Syrian war (2011) with the intervention of big countries in Syria, the Nagorno - Karabakh military conflict (2020) and the Russia - Ukraine military conflict (2022) shows the importance of high-tech weapon and technical equipment systems and the significance of building an autonomous defense industry. The answer to the question of whether to build and develop a DIC in a specific country or not, completely depends on the policy, path of autonomous development and the level of autonomy of that country in defense technology. For Vietnam, the country's thousands of years of history are the history of the people's struggle against foreign invaders and natural disasters; is the history of a country constantly under the gaze of external enemies. The peace of a country with about 100 million people[10] (ranked 15th in the world in terms of population out of more than 200 countries and territories in the world) like Vietnam needs to be decided by the Vietnamese people and cannot rely on external factors.

The Communist Party of Vietnam commented: After 35 years of implementing the Doi Moi (reform) process, our country has never had the same fortune, potential, position, and international reputation as it does today. With a long history, international position and national population size, Vietnam needs to determine to build a high level of self-reliance in defense industry development, contributing to ensuring peace in the country. The Communist Party of Vietnam's policy on developing defense industry has also affirmed the development of defense industry and security in the direction of autonomy, self-reliance, modernity, and dual use, becoming the spearhead of national industry *(Politburo, 2018; Communist Party of Vietnam, 2021a)*. Vietnam's 10-year socio-economic development strategy for 2021-2030 also determines to promote industrial development in the form of industry clusters, specialized product groups and the creation of large-scale industrial complexes; develop and improve the effectiveness of the national innovation system, taking businesses as the center *(CPV, 2021b)*.

Thus, in terms of development history, with the country's international position along with the Party's defense industry development policy and with the development trend of industrial clusters and global value chains, the DIC construction and development in Vietnam is very necessary, making an important contribution to implementing the policies and guidelines of the Communist Party of Vietnam on industrialization and modernization of the country *(Central Committee, 2022)*. In addition, the DIC is a part of the National Innovation System and can lead the National Innovation System in some technology fields. Meanwhile, Vietnam's National Innovation System is said to be still weak and has not contributed much to growth, the capacity to absorb technology and innovation of businesses is still limited, there are not many

[10] Vietnam is actively preparing for the event that the country's population will reach the 100 million marks by 2023, excerpt from the website: https://www.gso.gov.vn.

quality R&D results and there is a lack of integration and connection between the industrial and research sectors *(WB&MPI, 2016; WB, 2021)*. Therefore, the construction and development of the DIC will help to strengthen the connection between the industrial and research sectors, contributing to improving Vietnam's National Innovation System.

Second, the next question that needs to be answered is why Vietnam's defense industry development should follow a "complex" model. Today in the world, the production of high-tech weapons and technical equipment systems requires large investment and interdisciplinary knowledge, which is difficult for small and medium-sized enterprises to implement. For example, an F-35 fighter aircraft system produced by Lockheed Martin Corporation of the United States costs hundreds of millions of USD[11] or an S-400 air defense missile system manufactured by Almaz Antey Corporation of Russia also costs up to 500 million USD[12]. Such modern, complex, and expensive weapons and technical equipment systems require investment and leadership from large defense industry enterprises; and the production organization of these systems needs to be large-scale. Organizing defense industry production into a network/or ecosystem with the participation of the civil sector, helps to mobilize resources into production to increase significantly.

In recent years, the term "platform" has become almost ubiquitous in our daily lives. It appears in new product development, in business management and operations, in technology strategy, and in industrial economics *(Gawer & Cusumano, 2014)*. The platform business model is defeating and replacing the traditional pipeline business model, Geoffrey et al. (2016) call this change the platform revolution. Each high-tech weapons and technical equipment system itself are often an integration of a platform with many different technologies and devices. The world's leading defense enterprises such as Lockheed Martin, Boeing, Airbus, and many other businesses are also doing business under the platform model. Therefore, developing high-tech weapons and technical equipment systems in Vietnam is no exception, so it should follow the platform model structure. This means that there needs to be a business that owns the platform and around that platform business is a network of research and production organizations.

In addition, the achievements in science and technology of the Fourth Industrial Revolution have a profound impact on all fields and aspects of society, including military and national defense. The integration of scientific and technological advances of Industrial Revolution 4.0 creates new intelligent, accurate and more powerful weapons and technical equipment systems. The "complex" model

[11] Fact Sheet: F-35 Joint Strike Fighter: costs and challenges, http://armscontrolcenter.org.

[12] Russia is luring international buyers with a missile system that costs much less than models made by American companies, http://www.cnbc.com.

helps to mobilize civil organizations and businesses, which are dominating the technology of Industrial Revolution 4.0, to participate in research and production of weapons and technical equipment systems. The above analysis explains why the development of Vietnam's defense industry should move towards a "complex" model.

Third, another question that needs to be answered is, if a DIC must be formed, what will be the main development orientation of that complex. This is a very big question, difficult to answer thoroughly in this study. However, the authors of this article believe that Vietnam's DIC must be a dual-use industrial complex, aiming for revenue from civilian products accounting for a major proportion of the total revenue of the complex. This is consistent with Vietnam's defense strategy and policy, affirmed in the 2019 Vietnam National Defense white paper: "Vietnam's National Defense Strategy is a strategy to defend, protect the country, and preserve the country early on, and from a far" and "Vietnam's National Defense Policy is peaceful and self-defense". Thus, if DIC is formed, it will have the predominant function and task of producing civilian products; and have sufficient capacity to accelerate the weapons and technical equipment production when an emergency confronts the country. The above analysis of China's DIC and a number of other countries provides valuable suggestions for building a DIC that connects civil and military forces.

The next big direction that the authors of this article believe is that the DIC must be a development system based on science, technology, and innovation. This is consistent with the directions, guidelines, and policies of the Communist Party of Vietnam on industrialization and modernization of the country in the period up to 2030, with a vision to 2045. As analyzed above, DIC based on science, technology and innovation plays an important role in improving Vietnam's national innovation system, contributing to enhancing the national science and technology potential. Finally, the authors of this article believe that the established DIC will develop according to a platform model, targeting the international market; Some shared platforms require collaboration between the State and businesses participating in their development.

4. Some suggestions

To contribute to the implementation of the national industrial development orientation in general and the defense industry in particular, based on the relationship between the DIC and the National Innovation System, this article proposes the definition of the DIC as follows: the DIC is a linked system, cooperate defense enterprises with the subjects of the National Innovation System to develop the defense industry. Vietnam's DIC should be understood as an innovation ecosystem, serving the research, development, and production of technical equipment systems and civilian products. It is a part of the National Innovation System, contributing to improving and leading the NIS to develop in

a number of high-tech fields. Building and developing a DIC in Vietnam should be seen as an objective need of the history of building and protecting the fatherland, and requirements of industrialization and modernization of the country. Vietnam should not be caught up in debates about the role of the DIC as in the United States, understood as a trade-off between "guns" and "butter" or as a catalyst for wars and military conflicts. To form and develop Vietnam's DIC, the article proposes the following recommendations:

The state needs to support the process of forming a complex and identifying potential defense enterprises to become the nucleus or foundation of the DIC. This enterprise needs to be an enterprise with high innovation capacity, including: management and technology capacity, financial capacity (resources), strong R&D human resources and technical infrastructure and database systems for research, development, and production of high-tech weapons and technical equipment systems and civil products; Capable of organizing, researching and developing a number of platforms as a basis for production and business activities of other organizations and businesses in the ecosystem. In Vietnam's current defense enterprise system, the Military Industry and Telecoms Group (Viettel), in recent years, has always been chosen by Clarivate Company - a world leading consulting company headquartered in London, England, is considered the most influential enterprise in innovation in South Asia and Southeast Asia[13], and is the enterprise with the most potential to be considered as the nucleus of the DIC.

To establish and operate the DIC, the State needs to improve the legal and policy system so that private sector organizations and businesses can also participate in research, development, and production of the weapons and technical equipment system. In Western industrialized countries, especially the United States, private enterprises are the nucleus for the operation of the National Defense Forces. Other developing countries such as Turkey, Indonesia, or countries with transition economies such as China all have regulations that allow the participation of the private sector in research, development and production of weapons and technical equipment. Vietnam should consult those countries and promulgate as soon as possible policies that allow the private sector to participate in research, development, and production of weapons and technical equipment. Only with the participation of many economic sectors in DIC can this innovation ecosystem be complete, operate effectively and mobilize large enough social resources for the development of defense industry.

The State supports the DIC (or any industrial complex established according to the Party and State's development policies and guidelines) to improve innovation

[13] Viettel is the most influential Vietnamese enterprise in terms of innovation in South Asia and Southeast Asia, <https://viettel.com.vn/vi/tin-tuc-va-su-kien/tin-tuc/viettel-la-doanh-nghiep-viet-co-suc-anh-huong-nhat-ve-doi-moi-sang-tao-tai-khu-vuc-nam-a-va-dong-nam-a/>

capacity; Restructuring national R&D programs in the direction of coordinating with businesses to develop a number of background and core technologies to serve the production of national products and key products of industrial complexes in general and DIC in particular./.

REFERENCES

1. Communist Party of Vietnam (2021a). Political report of the 12th Party Central Committee, Documents of the 13th National Congress of the Party. Hanoi, National Political Publishing House Truth.
2. Communist Party of Vietnam (2021b). 10-year socio-economic development strategy 2021-2030, Documents of the 13th National Congress of the Party.
3. Resolution No. 29-NQ/TW dated November 17, 2022 at the 6th Conference of the 13th Party Central Committee on continuing to promote industrialization and modernization until 2030, with a vision to 2045.
4. Resolution No. 23-NQ/TW dated March 22, 2018 of the Central Executive Committee on orientations for building national industrial development policies to 2030, with a vision to 2045.
5. Ministry of National Defense (2019). Vietnam National Defense 2019. Hanoi, Truth National Political Publishing House.
6. World Bank - WB, Ministry of Planning and Investment - MPI (2016). Vietnam 2035: Towards Prosperity, Innovation, Equity and Democracy, World Bank, Washington D.C.
7. Akimkina Daria, Evgenii Khrustalev, Nina Barakova and Daria Loginova (2021). "Technology transfer of military-industrial complex as a factor in increasing the science intensity of the civilian economy", *SHS Web Conferences 114*, NTSSCEM 2021.
8. Barcellos Joao Miguel Villas-Boas (2022). "The military-industrial complex and its foundations: geopolitics, development, and technological advance", *Colecao Meira Mattos, Rio de Janeiro*, V.16(56): 327 - 351.
9. Byrne F. Edmund (2017). Military-Industry Complex, Encyclopaedia of Business and Professional Ethics, Springer International Publishing, Indianapolis.
10. Cheung Tai Ming, Anderson Eric & Yang Fan (2017). "Chinese defense industry reforms and their implications for US-China military competition", *SITC Research Briefs*, Series 9 (2017-4).
11. Cox W. Ronald (2014). "The military-industrial complex and US military spending after 9/11", *Class, Race and Corporate Power*, Vol 2(2), Article 5.
12. CRS - Congressional Research Services (2021). "The global research and development landscape and implications for the Department of Defense", CRS Report Prepared for Members and Committees of Congress, <https://crsreports.congress.gov>
13. Dunne J. Paul & Coulomb (2009). "Peace, war and international security: economic theories", in Jacques Fontanel & Manas ChatterJi (eds), War, Peace and Security, Bingley, Emerald.
14. Dunne J. Paul & Elisabeth Skons (2009). "The changing military-industrial complex", <http://www.researchgate.net>
15. Erkko Autio & Llewellyn D.W Thomas (2014). "Innovation ecosystem: Implications for innovation management", *The Oxford Handbook of Innovation Management*, Oxford University Press, Oxford.
16. European Commission - EC (2009). Defense industry: comprehensive sectoral analysis of emerging competences and economic activities in the European Union, European Community Program for Employment and Social Solidarity.

17. Freeman, C (1987). Technology and Economic Performance: Lessons from Japan, Printer, London.
18. Gansler S. Jacques (2007). "US defense industrial policy", *Security Challenges*, Vol 3(2): 1-17.
19. Gawer Annabelle and Michael A. Cusumano (2014). "Industry platforms and ecosystem innovation", *Journal of Product Innovation Management*, 31(3): 417 - 433.
20. Geoffrey G. Parker, Marshall W. Van Alslyne and Sangeet Paul Choudary (2016). Platform revolution: How networked markets are transforming the economy - and how to make them work for you, W. W. Norton & Company Inc., New York.
21. Gibbs David (1991). *Political Economy of Third World Intervention*, University of Chicago Press, Chicago.
22. Gregova Elena, Irina Tulyakova & Victor Dengov (2021). "The financial condition of corporations of Russian defense-industrial complex, which are included in the TOP lists of the largest military companies in the world", *SHS Web of Conferences 129, Globalization and its Socio-Economic Consequences 2021*.
23. Judith Reppy (2000). "The place of defense industry in National Innovation System", *Peace Studies Program Occasional Paper* #25, Cornell University, Ithaca.
24. Menshchikov, V.V (2007). "Defense-industrial complex: state, problems, prospects", *Military Thought*, Vol.16(1), Jan-Mar 2007.
25. Mills C. Wright (1956). The Power Elite, Oxford University Press, Oxford.
26. Nzeribe Samson & Imam Muhktar (2018). "The military industrial complex: a catalyst for conflicts and wars (USA)", *Journal of Social Development*, 7(1): 73 - 81.
27. OECD (1995). Economic restructuring and defense conversion in a Russian city: the case of Zhukovsky, Moscow Oblast, OCDE/GD (95)62, *Publication Services*, Paris.
28. OECD (1997). National Innovation System, OECD Publications, Paris.
29. OECD (2014). Corporate governance of company groups: international and Latin American experience, CNMV, Bogota.
30. OECD (2019). Main science and technology indicator, OECD Publishing, Paris.
31. Rostec (2017). Annual Report 2017 Rostec State Corporation, <https://rostec.ru>
32. Shlykov, V.V (1995). "Economic readjustment within the Russian defense-industrial complex", *Security Dialogue*, Vol.26(1): 19-34.
33. SIPRI (2022). "The SIPRI top 100 arms-producing and military services companies 2021", *SIPRI Fact Sheet*, December 2022, <https://www.sipri.org>.
34. Smart Barry (2016). "Military-industrial complexities, university research and neoliberal economy", *Journal of Sociology*, 3(52): 455 - 481.
35. Tresno Wicaksono & Agung Anak (2020). "The military-industrial complex in a developing country: lessons from the Republic of Turkey", *Journal of Hubungan International*, Vol.9(1): April-September 2020.
36. Wang K.H, Su C.W, Tao R & Chang H.L (2019). "Does the efficient market hypothesis fit military enterprises in China?", *Defense and Peace Economics*, Vol.30(7): 877 - 889.
37. Weber, N. Rachel. (2018). "Military-Industrial Complex", <https://www.history.com/topics/21st-century/military-industrial-complex>
38. World Bank - WB (2020). Military expenditure (% of GDP), World Development Indicators, <http://data.worldbank.org/indicators>
39. World Bank Group - WB (2021). Vietnam: Science, Technology and Innovation Report 2020, World Bank Publications, Washington D.C.