CHARLES UNIVERSITY

FACULTY OF SOCIAL SCIENCES

Institute of Political Studies

Master Thesis

2022 **Kseniia Miliutina**

CHARLES UNIVERSITY

FACULTY OF SOCIAL SCIENCES

Institute of Political Studies

Kseniia Miliutina

Analysis of Russian policy on the development of Artificial Intelligence in the military

Master Thesis

Prague 2022

Author: Bc. Kseniia Miliutina

Supervisor: Mgr. et Mgr. Tomáš Kučera, Ph.D.

Academic Year: 2021/2022

Declaration of Authorship

1. The author affirms that she wrote this thesis entirely on her own, utilizing only the materials and publications specified.

2. The author declares that all sources and publications consulted have been appropriately credited.

3. The author affirms that the thesis was not utilized to acquire a different or similar degree.

Prague 03/05/2022

Kseniia Miliutina

References

Miliutina, K. (2022). Analysis of Russian policy on the development of Artificial Intelligence in the military.Charles University. Faculty of Social Sciences. Institute of Political Studies. Department of Security Studies. Supervisor Mgr. et Mgr. Tomáš Kučera, Ph.D.

Abstract

In the near future, the new global technological race will result in the introduction of cutting-edge advancements in the military sphere. All of the world's major countries will be involved in this, because any lag from their competitors increases vulnerability, which will be tough to conceal with conventional weaponry. Furthermore, the advent of new technology may result in significant changes in the armed forces' strategy, planning, and organization. That is why Russia is aggressively pursuing the development of Artificial Intelligence and incorporating it into its military strength in order to preserve its military potential and effectively fulfill its national and foreign policy (FP) goals.

The purpose of this research is to provide a complete analysis of the key stages of development and future use of Artificial Intelligence (AI) in Russia's military strength. At the present, AI is one of the highest priority advanced fields that the Kremlin regards as the primary mechanism for successfully implementing its internal and external strategic goals. Furthermore, the active introduction of such intelligent systems has led to the country becoming an active participant not only in the harvesting field, but also in the international military arena. As for Russia, the development of modern technologies gives it hope to achieve the desired parity with potential competitors in a number of vital areas, helping to compensate for the country's existing economic weakness and technological backwardness in many industrial sectors. Nowadays, the Kremlin shows great assertiveness in becoming the leader of AI's implementation in the military field. However, as the analysis shows the leadership if the armament cannot be achieved through the development of a single sector and the large increase in its production volume. Furthermore, due to strong sanctions, internal and external economic, and strategic-political problems, the country cannot achieve innovative superiority. Thus, the above-mentioned structural limitations and ill-considered tactics in autonomous weapons (AWs) production not only challenge the fulfillment of defined FP goals and national interests but also its motivation to be a leader in arms production.

Keywords: Artificial intelligence (AI), autonomous weapons systems (AWSs), arms production, Russian military

Abstrakt

Nový globální technologický souboj povede v blízké budoucnosti k zavedení nejmodernějších vymožeností ve vojenské oblasti. Zapojí se do něj všechny významné světové země, protože jakékoli zaostávání za konkurencí zvyšuje zranitelnost, kterou bude těžké utajit konvenčními zbraněmi. Kromě toho může nástup nových technologií vést k významným změnám ve strategii, plánování a organizaci ozbrojených sil. Proto Rusko agresivně usiluje o rozvoj umělé inteligence a její začlenění do své vojenské síly, aby si zachovalo svůj vojenský potenciál a efektivně plnilo své národní a zahraničněpolitické (ZP) cíle.

Cílem tohoto výzkumu je poskytnout kompletní analýzu klíčových fází vývoje a budoucího využití umělé inteligence (UI) v ruské vojenské síle. V současné době je UI jednou z nejprioritnějších pokročilých oblastí, kterou Kreml považuje za primární mechanismus pro úspěšnou realizaci svých vnitřních i vnějších strategických cílů. Aktivní zavádění těchto inteligentních systémů navíc vedlo k tomu, že se země stala aktivním účastníkem nejen na poli žactva, ale i na mezinárodní vojenské scéně. Pokud jde o Rusko, rozvoj moderních technologií mu dává naději na dosažení žádoucí parity s potenciálními konkurenty v řadě životně důležitých oblastí, což mu pomáhá kompenzovat stávající ekonomickou slabost a technologickou zaostalost země v mnoha průmyslových odvětvích. V současné době Kreml projevuje velkou asertivitu, když se chce stát lídrem implementace umělé inteligence ve vojenské oblasti. Jak však vyplývá z analýzy, vedoucího postavení, pokud jde o vyzbrojování, nelze dosáhnout rozvojem jediného odvětví a do značné míry zvýšením objemu jeho výroby. Navíc kvůli silným sankcím, vnitřním a vnějším ekonomickým a strategicko-politickým problémům nemůže země dosáhnout inovační převahy. Výše uvedená strukturální omezení a neuvážená taktika v oblasti výroby autonomních zbraní (AWs) tak zpochybňují nejen naplňování definovaných cílů RP a národních zájmů, ale i její motivaci být lídrem ve zbrojní výrobě.

Klíčová slova: Umělá inteligence (UI), autonomní zbraňové systémy (AZS), zbrojní výroba, Ruská armáda

Abbreviations

AF	Armed Forces
AI	Artificial Intelligence
AWS	Autonomous weapons systems
DARPA	The Defense Advanced Research Project Agency
DL	Deep Learning
FP	Foreign Policy
FPI	Foundation for Advanced Research Projects in the Defense Industry
KGB	Komitet Gosudarstvennoy Bezopasnosti (The Committee for State Security)
MBT	Main Battle Tanks
MIC	Military Industrial Complex
ML	Machine Learning
OPK	Oboronprom United Industrial Corporation
UAC	The United Aircraft Corporation
UAV	Unmanned Aerial Vehicles
VKS	Vozdushno-Kosmicheskie Sily (The Russian Airspace Forces)

Content

Acknowledgements

I would like to express my inestimable gratitude to those people who supported me throughout my studies, without whom this final thesis would not have been written.I am exceedingly grateful for the tremendous assistance, patience, and understanding that I got throughout my studies. I would like to thank my supervisor, Dr Kučera, for his professionalism, constant aid, patience, and vast knowledge during our hard work. His advice was invaluable to me during the research and writing of this work.

I would also like to thank my family for their endless support in all my endeavors. As Oscar Wilde said at one time, you can't change the direction of the wind, but you can always raise your sails to reach your goal. Thank you for your faith in me and in my potential.

The endless professionalism of the entire teaching staff is also something I can not underestimate. I want to express my appreciation to every professor with whom I studied and who helped me gain new knowledge and discover my abilities, while also showing patience and encouragement to constantly push myself to grow.

Introduction

The evolution of international relations at the present stage is influenced by a number of large-scale changes not only in politics, economics, and the social sphere, but also in science and technology. In recent decades there has been a visible acceleration in the development of advanced technology, autonomous weapons systems (AWSs), and Artificial Intelligence (AI). All this is not only changing the daily life of society, but also has a transformative effect on military affairs. In particular, it changes ideas about the limits and ways of using military force, leading to the production of new types of weapons, military and special equipment, which in turn affects world politics. In the current environment, military force remains an extremely important instrument of foreign policy (FP) for a significant number of states, especially those that occupy the most prominent position in the international arena. At the moment, the potential of AI is not fully disclosed, but already now this area can be called a new wave, which may fundamentally change the usual understanding of the military potential. It is also believed that AI technology will strengthen national security, increase the efficiency of many sectors of the economy, and in general increase the level of influence and status of the country in the international arena.

However, along with breakthrough developments in certain industries, the development of Artificial Intelligence is likely to be accompanied by an increase in risks. Particularly hotly debated are the prospects for the military use of lethal autonomous systems (LAWS), combat vehicles with varying degrees of AI and the prospect of being able to make their own decisions. The issue of introducing this type of weaponry is new to the international agenda, and lies at the intersection of political, legal, technological and ethical-moral considerations. That is why it is difficult for states or international organizations to develop a unified approach. Also, the development of AI in the military sphere will inevitably provoke changes in the positions of states in the international arena and, accordingly, increased competition between new and already established centers of power. In this connection it seems important to pay attention to the development of Artificial Intelligence technologies as a factor that can significantly affect the geopolitical processes of the future, in particular the prospects of military affairs. In this study the special focus will be placed on analyzing the Russian proactive initiatives in integrating AI in the military field. It can be claimed that currently the Kremlin is actively intending to become the leader in the field, thus, challenging the current

dominant actors such as China and US. Following this approach, this thesis will address the major objective of determining whether a country with numerous structural limitations (e.g., economic, political, strategic, and others) can compete with the leading weapons makers by focusing on developing only one specific sector of armament. Moreover, it is vital to understand if Moscow is currently able to maintain its technological potential along with being a part of the arms race under its current highly criticized international status.

To begin with, the thesis will be opened by ***Chapter I*** on the background of the arms trade and the emergence of Artificial Intelligence as a particular knowledge and afterwards a well defined scientific field. Despite the cessation of the large-scale Cold War arms race, this problem not only persists, but is even growing. In particular, this trend of military buildup is increasing due to the development of new military technologies. However, this tendency has always been present. The only debate and controversy has centered on understanding what motivates countries to engage in the arms race. Many researchers hold the view that producing countries aim to achieve their economic, political and security interests (Stohl & Grillot, 2009, p. 18). Others, on the contrary, hold the idea that many countries want to achieve their domestic and foreign political objectives (Moravcsik, 1991). It is worth noting that there are also a number of political actors who seek to achieve their strategic victories at the regional level. A number of states involved in regional conflicts are seriously considering the possibility of creating different types of weapons to counter threats to national security. At the same time, this problem affects regions whose economic situation is far from prosperous and the arms race diverts resources needed for their economic and social development. According to Michael Roberts (1967) there have been multiple military revolutions in the globe during the previous three millennia, each of which has resulted in a socio-political shift. Nevertheless, the possibility and process of technical development itself acted as a stimulus for the armaments transfer system, because quick spread of advances was required for military efficiency. Therefore, the development of Artificial intelligence and its further integration in the military field is transforming the modern military-strategic landscape and abolishing traditional arms control understanding.

It should be noted that the ideas given for weapons market analysis are relatively incomplete or limited due to the difficulty of finding relevant and reliable information. Moreover, many countries do not publish all of their data on the development of this field. Therefore, ***Chapter II*** will introduce the theoretic framework of this thesis, mainly addressing the case of the

development of the armament market and how its actors can be analyzed. According to Keith Krause "there has been little detailed work on how to divide the tiers or on what would determine membership in them (other than an ad hoc evaluation based on market share), no systematic attempt to relate this to the structure of the defense industry in various states, no attempt to determine if this structure is historically aberrant, and little attempt to assess the possibilities of movement between tiers" (Krause, 1992, p. 9). The author, in turn, expanded on this concept and advocated a pretty comprehensive split of the arms market into distinct layers of manufacturers and suppliers (the so-called three tiers). The author agrees that the topic on arms production is too complex to examine in depth, but he bases his argument on three key factors: the historical development and formation of the international arms transfer system; the role of technological innovation; and the relationship of all three levels of actors to one another (Krause 1992). Thus, making it possible to formulate a successful hierarchical top-down structure of the arms producers that can be used as a tool to analyze any type of the weapons market.

Chapter III will introduce the Russian initiative on the development of the military field by relying on the historical development and rise of weapons production. The military-industrial complex of the Russian Federation is a dynamically developing sector of the economy, the main task of which is the development and production of advanced weapons, military and special equipment mainly for the equipment and innovative development of the Armed Forces of the country. During the Soviet period, Russia's military industrial complex (MIC) began its first stages of development. The main characteristic of the Soviet initiative to build up its military potential was to ensure concentration of all resources and military parity on a fully centralized system of national administration and targeted use of all available resources. The planned centralized management during the Second World War enabled, in a short period of time, a complete restructuring of the economy in accordance with the needs of the front. Moreover, the military conflict resulted in significant shifts both in the economic structure of the country and in the distribution of productive forces. Thereby the Soviet Union was gradually able to successfully build up its resources and economic capacity for the successful development of its military industry. In doing so, the Soviet leadership actively sought to develop a type of armament whose production would be based on the use of dual technology suitable for the development of the military sector.

During the Cold War, the Soviet military-industrial complex began to play a significant role in the world economy and international relations. The activities of the USSR MIC in the international arena were mainly aimed at military competition with the US and NATO countries in general; creation and functioning of the military-industrial complex of the socialist camp countries as a single mechanism; and active build-up of military and technical cooperation with countries with less developed innovation potential. Thus, the USSR successfully held its own in the international arena as a leader in the arms industry on a par with the United States. With the collapse of the USSR, the military-industrial complex, together with the Russian society, entered a period of deep crisis. In the early 1990s it acquired the character of a lobby group, which tried to protect the interests of the military and the defense industry in the political leadership of the new Russia. Furthermore, with the reduction of conventional military capabilities, Russia began to focus on more specific industries such as nuclear deterrence. In recent years, the Kremlin has actively focused on the development of AI and its further integration into the military sphere.

Following this initiative, ***Chapter IV*** sheds the light on the rise of the production of Artificial Intelligence, including autonomous weaponized systems. Autonomous lethal weapon systems refers to a type of autonomous military system that searches for and engages a target without meaningful human control based on a given spatial and temporal framework. Autonomy is present in many military systems that aim to regulate and control (e.g., drones, automated turret systems, missile defense systems, etc.) Most specific advanced autonomous weapons will be discussed in Section 4.3. Also, Section 4.2 will introduce different types of autonomy and how they differ on a practical level. It should also be understood that the use of AWS raises legal, ethical, and moral issues that are of concern not only to experts and governments, but to the entire international community. Most states advocate banning the use of this type of weapon because of the threat to international security. But there are also those who emphasize the potential benefits of how wars will be fought in the future and consider any legal regulatory options premature. Finally, AWSs could lead to a paradigm shift in the rules of warfare. With advances in technologies such as facial recognition and autonomous navigation, AWSs can be used in assets ranging from tanks and ships to small commercial drones. They allow the deployment of highly lethal systems on the battlefield that cannot be controlled or recalled once launched. Unlike other types of weapons, AWSs can also target a specific group based on parameters such as age, gender, and ethnicity (if such information is loaded into the program algorithm). Moreover, there are huge gaps in the effectiveness of

using Machine Learning (ML) and Deep Learning (DL) in arms development. Therefore, Section 4.4 is aimed to address all the limitations of AI development in the defense sector.

Finally, ***Chapter V*** will introduce an analytical section on the Russian initiative in the AI military production. By following the earlier introduced theoretical framework (Chapter II), the thesis aimed to place the case of study - Russian Federation - in Krause's (1992) arms production top-down hierarchy. In doing so, firstly the discussion will be started with understanding the reasons behind the Kremlin's initiative in developing weaponized AI. Russia is concentrating its efforts on developing smart autonomous systems that will provide troops with maximum access to the necessary data in order to assure security in a combat situation. Moreover, under Putin's initiative with a monopoly in the field of Artificial Intelligence, the country will be able to become the most influential actor in the international arena. Thus, the Russian plan is centered on information supremacy in the military sector, and AI-based technologies are seen as critical to accomplishing this aim (CNA, 2021). It is worth emphasizing that this approach varies from traditional Russian methods, which before used to rely on raw force and a large inventory of military assets. Furthermore, the Russian Federation is investing in the autonomy of automated air, land, and sea platforms, as well as robotic platforms. Further concrete examples of the different types of the Russian military systems and technologies with AI components will be introduced in Section 5.2. However, apart from the great initiative in Artificial Intelligence integration in the military field and desire to become the dominant actor in the AWS production, Russia is currently facing significant structural limitations that are challenging its domestic and international abilities. Thus, Section 5.3 will present a comprehensive analysis of the country's economic limitations along with the structural-political problems. Moreover, the newly (2022) imposed international sanction has affected all the Russian economic and industrial sectors that aim to stimulate the growth of technological potential.

Methodology

The work will be conducted using analytic research of the case study. Primary sources, such as military conferences, speeches, interviews, and presentations in which the Russian Federation participated and addressed the use of weaponized artificial systems (AWS), will be studied accordingly. Despite this in-depth range of resources analyzed, it should be understood that access to information is rather limited because the topic of Artificial Intelligence (AI) development in the military sphere is quite new and sensitive (many countries are limited in providing a full range of information on what military technologies they are developing). Thus, the methodology of this paper will focus only on publicly available sources and materials.

Whereas descriptive research creates a relationship between the properties of the phenomena under investigation, analytical research assesses if the discovered link is causal in nature. The analytical technique in this article will be based on an examination of the criteria for the development of AI in Russian military technology. The underlying motivations behind this variable will be discovered by a rigorous review of the Kremlin's pronouncements on military buildup. Because of the complexities of this issue, the research will rely on a solid theoretical foundation to establish the present practices, policies, and reasons of the Kremlin's proactive effort in armaments manufacture. Keith Krause's idea will be utilized as a theoretical framework to identify important incentives for armaments development in this way.

Furthermore, the empirical method predates any particular political conclusion by gathering and summarizing huge volumes of factual evidence. It focuses on critically analyzing judgments made on the one hand, and broadening the variety of alternative options for actor behavior on the other. As a result, the empirical method aims to examine the usage of weaponized AI in the Russian military as well as potential driving reasons for its growth.

Chapter I. Arms trade & rise of AI, literature review

The causes for the creation and continued implementation of Artificial Intelligence systems have been examined from several angles. However, these theories are limited to fully comprehend the evolution of these systems in the military arena. Furthermore, many countries currently lack a formal national program for the development of AI. As a result, there is an increased interest in determining where and how an active desire for the deployment of these advanced technologies in the military sector emerges. Above all, it is important to comprehend the significance of the expansion of the arms trade. It is vital to analyze the many reasons why governments participate in the manufacturing and selling of weapons. Finding these answers and reasons is in some sense a broad and multifaceted task; several theories should be highlighted that seek to answer this question.

To begin, "three incentives are especially important - power, security, and economy" (Stohl & Grillot, 2009, p. 18). These major elements are referred to by Pearson as a "military ambition", "threat perception", and "economic prosperity". It is worth noting that "most of the existing research on proliferation is based on the ostensibly plausible premise that performance factors determine procurement decisions" (Suchman & Eyre, 1992, p. 140). In practice, this may be demonstrated by the active desire of sovereign actors, in this case governments, to fulfill their military and strategic intentions in order to eliminate internal or foreign threats. Allison and Morris (1975, p. 103-104), who define this approach as the "prevailing simplification", emphasize that "weapons are the result of national strategic choice; government leaders select specific weapons and total force posture on the basis of precise calculations about national objectives, perceived threats, and strategic doctrine within the constraints of technology and budget" (Suchman & Eyre, 1992, p. 141; Hall & Schroeder, 2005). These concepts have since formulated a variety of so-called strategic-functional theories. Despite the fact that these studies are extremely controversial, they do tend to emphasize the centrality of the concept of national interest in the question of military growth. Nevertheless, it should be noted that the advancement of new technology has complicated the military sector. Thus, it is debatable if the desire to use Artificial Intelligence as a weapon is only for national security reasons.

Another intriguing aspect is the study and analysis of military aspirations. According to Maiolo (2016, p. 1), the term "arms race" was coined in the nineteenth century and was widely considered as one of the reasons for World War I. The concept has been closely tied to the potential to pursue widespread mobilization of soldiers along with the mass manufacture of military assets (Christie, Buts, & du Bois, 2021, p. 6). Following Colin Gray's research (1971, p. 41), there should be completed four characteristics to define an arms race: "(1) there must be two or more parties who are aware of their antagonism; (2) they must structure their armed forces with consideration for the forces' likely effectiveness in combat with, or as a deterrent to, the other arms race participants; (3) they must compete in terms of quantity (men, weapons) and/or quality (men, weapons, organization, doctrine, deployment); (4) there must be rapid increases in quantity and/or improvements in quality" (Christie, Buts, & du Bois, 2021, p. 6). Additionally, the similar concept introduced Richardson (1960). The author extensively pursued the notion of "action-reactions" which may be viewed as rivalry between various governments in building up military capabilities (Ibid). To assess market dynamics, the author developed a pair of differential equations that mirror the well-known supply and demand equations. In turn, Richardson used statistics on military spending as components of his equations to further investigate the causes of military conflict. However, as Maiolo (2016, p. 4) observes, "the sporting metaphor may be deceptive: whereas athletics championships have identifiable start and finish lines, arms races do not" (Gleditsch & Weidmann, 2020). Aside from that, the idea of the arms race is deficient in specifying what kind of military technologies can participate in it. For example, comparatively narrower technology such as armored vehicles, submarines, jet propulsion, and others underlay several of the twentieth century's great power arms races. AI, according to Scharre (2019), is not a narrow military technology, and so cannot be the target of this race. As a result, while many notable researchers recognize the idea of militarism as one of the primary causes for growing military spending, it falls short of fully describing this trend as well as its complete applicability to the contemporary arms trade's tendencies.

Besides, the second widely held belief is that increasing military equipment and weapon acquisitions have a negative influence on a country's "economic growth, either through short-term economic changes (e.g. structural shifts such as rising oil costs)" (Suchman & Eyre, 1992, p. 141-142). The argument here is that as the need for security grows, so does the demand for guns, making both activities dependent factors. Nevertheless, it should be noted that this economically focused approach tends to be more nationally centered, as does

Richardson's action-response theory. Although one cannot help but concur with this information, the author's investigation still cannot be considered as sufficiently complete.

In return, Andrew Moravcsik argues that the primary reason for improving a country's military capability is not solely national in nature (Moravcsik, 1991). Instead, this desire is multifaceted and will be examined by taking into account other elements such as commercial interests, domestic/foreign political complexity, and many more (Ibid). Furthermore, it should be noted that national interest rhetoric is frequently affected by a country's ruling class. Holsti (1970), for example, states in his study that governments' FP activity shapes the national role; in other words, there is a "pattern of behavior that is obviously formed by political leaders that may affect the language of national interest. It encompasses patterns of attitudes, actions, responses, functions, and obligations to other countries, which he refers to as *national roles*" (Ibid, p. 245). As a result, it should be clear that study into the evolution of the weapons trade and its absorption of Artificial Intelligence cannot be described solely by the concept of the primacy of national interests and their connection to the acquisition and manufacture of weaponry. As a result, the question of what theory is capable of establishing the causes for the growth of military powers emerges. The ability to explain the present interest in the development of AI and its potential use as a weapon will also be critical.

Therefore, comprehending the evolution of the weapons market entails comprehending the conduct of all local and international parties is crucial. Furthermore, whether the aim is a national strategic requirement, a factional interest, or a superpower ambition, a sensible choice must be made (Suchman & Eyre, 1992, p. 148). Following this idea, various academic sources have examined the issue of institutional theory in recent years, which tends to characterize society as something more complicated and organized than a specified power-balancing setting. "Institutional theory sees society as more than a network of exchange interactions and power-balancing activities", argue Suchman and Eyre (Ibid). According to institutionalists, "the social world is a cultural system, organized by a developing set of categorical prescriptions and proscriptions that define and constrain proper activity" (Ibid). The study of the forces that shape specific laws in society is thus the fundamental focus of social analysis. In practice, this may be demonstrated as the primary function of a broader world system that impacts state creation as a "carrier of communal values and aims" (Thomas & Lauderdale, 1988). This may imply that the fundamental push for the expansion of the weapons business is not the autonomous activity of the state, but the

"metonymical iconography of the global cultural order" (Suchman & Eyre, 1992, p. 150). From an institutionalist standpoint, the use of Artificial Intelligence in armament may be characterized not as some type of threat or problem that is actively resonating with the global public, but rather as phases of convergence in the behavior of nation-states.

It is worth noting that the early thoughts on arms market analysis given here are fairly incomplete. These theories emphasize the importance of a more in-depth sociological investigation in order to comprehend weapon development. The view that technology determines social structure and social connections, on the other hand, is becoming increasingly common nowadays. This concept also expands on the notion that technical innovation is a critical role in the growth of the weapons market. Based on these assumptions, there can be devised a theory of Military-Technological Determinism, according to which each stage of historical evolution is marked by changes in military technology (Kuo, 2021). As a result, the most sophisticated countries rise to the top. However, Michael Roberts' thesis of "military revolution" is the most comprehensive of the technical determinism hypotheses (Roberts, 1976). Although this theory attempts to track the evolution of the military market, it is still somewhat incomplete because it mostly focuses on the historical chronology of weapon development.

On the other hand, Keith Krause extensively quoted Roberts' views, although they were based on the subordinate history of military theology. They helped Krause to independently identify the major motivations for governments to enhance their military capabilities. The author discovered certain tendencies in the arms manufacturing sector through in-depth historical study and developed criteria for categorizing producers into three primary categories based on their motives and technological capabilities. As a result, the next chapter will feature Keith Krause's study on Arms and the state: patterns of military production and trade (1992), which addressed the military field's technological growth as well as its quick evolutionary dynamics.

Chapter II. Theoretical framework

2.1 Justifications for the manufacture & export of arms

As a result of the processes of the military revolution, the fundamental motives for the arms trade as a justification for the manufacturing and subsequent export of weapons and military equipment were formed. Their identification is a critical aspect in evaluating the succeeding sorts of weapon manufacturers given. According to Krause (1992), there are three fundamental growth motives with inherent qualities.

To begin with, ***the pursuit of wealth*** originated from the idea of the armaments industry as one of the primary means of hastening the pace of industrialisation and economic growth. At the moment, arms exports serve as a source of foreign cash while also benefiting the balance of payments. Furthermore, the armaments industry may be viewed as a successful economic growth strategy.

Krause (1992, p. 97) outlined several key inherent qualities of this motivation such as

> (1) supply foreign exchange and have a favorable impact on the balance of payments;
> (2) reduce the cost of domestic weapons purchase through manufacturing economies of scale;
> (3) maintain jobs and infrastructure in defence-related sectors;
> (4) recoup research and development costs;
> (5) use military production as a growth engine for economic development.

The ***pursuit of power*** is founded on the concept that through exporting, the providing country acquires influence over the importing country, allowing it to pursue its foreign policy objectives more successfully. The supplying state's desire to contribute to the stability and security of the importing state through arms transfers strengthens connections between the exporter and the recipient. In this method, an environment for interoperability is created. Finally, efforts to achieve or maintain regional balance through arms exports should be recognized. The objective of retaining influence in the region is developed in this way.

Key qualities (Ibid, p. 98) can be presented as such

(1) gain access to and influence over leaders and elites in recipient countries in order to achieve foreign policy objectives;
(2) represent a commitment to the recipient's security or stability in the face of internal or external challenges;
(3) establish or preserve a regional balance of power;
(4) establish or keep a regional presence;
(5) provide access to limited, costly, or strategic resources.

Last but not least, as for the ***pursuit of victory in war***, "although war is, in some ways, just a tangible expression of the *pursuit of power*, the demands produced before, during, and after conflict can have direct and indirect consequences on the weapons transfer and production system that are separate from the repercussions induced by nations' excessive *pursuit of power*" (Ohlson in Krause, 1992, p. 17). The impact of conflict can spur increased demand for arms. And this variable does not have to imply simply a growth in arms exports, but also the expansion of the domestic arms sector. It should also be realized that conflict has negative consequences, such as capital degradation, a shift in investment priorities, labor shortages, and other issues. Whatever the macroeconomic repercussions, they will have an impact on the weapons sector in some manner, triggering the growth of the arms transfer and manufacturing system (Ibid). By reaching this point, Krause outlined several qualities for this motivation as such

(1) to maintain military security, establish the independence of weaponry supply;
(2) function as a bribe in exchange for military base/landing privileges (or intelligence-gathering facilities);
(3) assist friends and allies in maintaining a strong (and/or shared) defensive stance in the face of external threats;
(4) as an alternative to outright military engagement;
(5) conduct testing on new weapon systems.

According to Krause, all of the aforementioned incentives are intrinsically tied to the concept of technological change. For example, the transmission of military and economic technology from more developed civilizations to less developed societies is a critical component of international power redistribution. In terms of military conflicts, it is essential to recognize that each component of the chain of military action creation has a technological genesis. According to the author, if the "analysis is simplified to a system of weapons transfer and production, then changes in the diffusion of military technology (as a subset of technology in

general) may be predicted to be a major ingredient in shaping patterns of arms production and trade" (Krause, 1992, p. 18). Therefore, the function of technical innovation as an independent factor driving the waves of the weapons transfer and production system is described as well as an international arms transfer system life cycle is indicated. The author emphasizes the importance of understanding these various motivations because it allows for a better understanding of the "evolution of the global arms transfer and production system and helps to explain the rapid spread of new military technologies as states try to assert their status and independence in the international political hierarchy" (Ibid, p. 98).

Despite the active use of the notion of "military technology" and reinforcement of the assumption that it impacts the military process, there is still an implicit divide between the phrase's several connotations. Krause explains how he distinguishes the notion. Figure A depicts four categories of military technology classified according to their level of sophistication, with the most rudimentary having the most widespread geographic distribution and the most advanced being relatively uncommon.

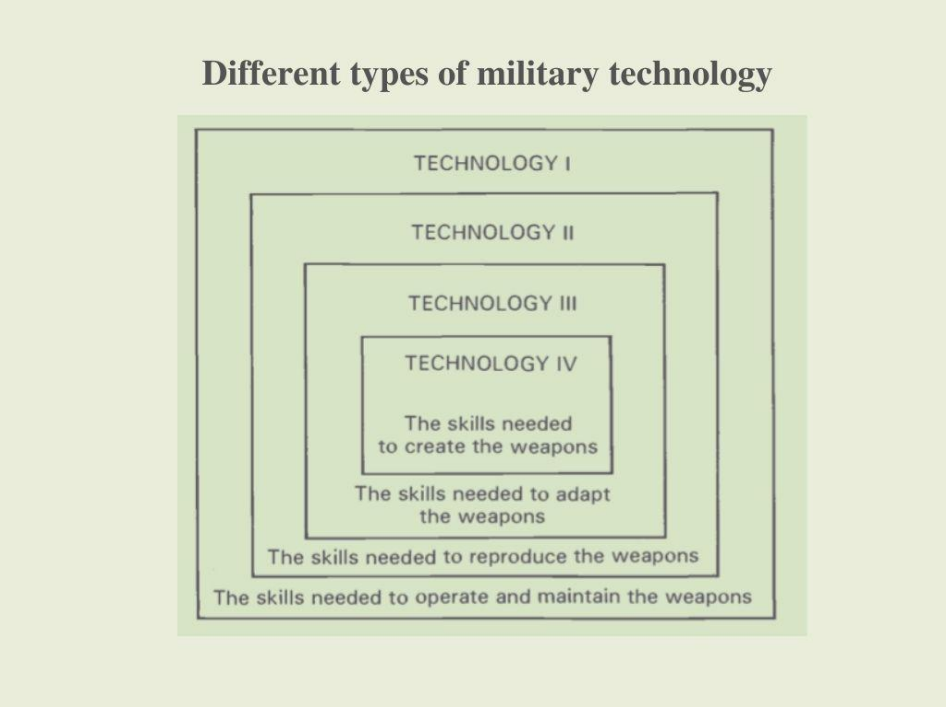

Figure A

Source: Krause, 1992, p. 19

The simplest technology is Technology I, which is used to operate weapons (or weapon systems) and accompanying facilities. Technology II refers to scientific and engineering abilities that can recreate previously developed technologies. Technology III refers to increasingly complicated kinds of technology, often military and commercial in nature, with a focus on upgrading certain sorts of weaponry. Technology IV examines the social, political, and economic organization (or motivation) required to generate new kinds of technology and innovation. This classification of military technology is significant since it explains how an invention might be understood and categorized. Thus, after establishing the idea of technical innovation and outlining the primary motivations for weapon manufacturing and development, Krause's study seeks to discover how these motivations present themselves in the current arms transfer and production system.

2.2 Characteristics of the arms producers

Krause offers his evolutionary dynamics of the arms transfer and manufacturing system, building on his prior ideas regarding the arms market. According to the author, the ability to develop contemporary weapons, as well as the skill to employ them, is unequally distributed. In his consideration of the hierarchy of armaments producers, Krause makes considerable use of the concept of "technical diffusion" (Krause, 1992, p. 31). The author seeks to understand why arms transfers are decreasing and why certain governments might lose or change their status. According to him, there is a definite international hierarchy, and governments that fail to compete in the manufacturing of weaponry fall out of or do not achieve great power status.

First-tier producers & suppliers

To begin with, Krause presents his evolutionary dynamics of the arms transfer and production system, drawing on previous views about the arms market. He argues that the rapid expansion of the armaments business is due to a number of causes. To begin, the author claims that there is a disparity in the distribution of weapon technology production capability among the stakeholders. However, it has yet to be adapted to the needs of warfare. "As a result of the uneven distribution of the new engines of technical innovation, leading centers of production and invention develop" (Krause, 1992, p. 26-27). This progressive effort, on the other hand,

will be motivated principally by the goal of success in conflict (***the pursuit of victory***) as well as the ***pursuit of power***" (Ibid). In this condition, there is a continual great desire for new technologies or other components that can aid with any additional development, such as resources, raw materials, better job skills, and others. As a result, several actors in the production chain are straining to meet these new demands. However, some successful producers are able to expand their expertise, establishing new production centers and becoming so-called *first-tier* arms producers. "They are capable of not just innovating and pushing the technical envelope, but also of producing weapons systems for all military uses" (Ibid). Furthermore, these players tend to have the greatest domestic markets and research and development institutes, and while being the main exporters, their sectors do not rely on exports for existence. The author uses the Soviet Union and the United States as examples. He does, however, remind that, despite the fact that both nations were 'first-tier' arms makers, they had clearly different production and decision-making processes.

Nevertheless, Krause highlights in the debate that with the technical advancement processes, certain governments are having challenges in obtaining technological progress in the weapons industry. It is explained by the fact that "state power is frequently equated with military power, and since possession of the most powerful weapons available has long been a driving influence behind the foreign policy, demand from states that do not possess weapons based on new technologies will result in a rapid expansion of the arms trade" (Ibid, p. 27). As a result, first-tier arms manufacturers now have an effective instrument for controlling the arms production market. As a country with substantial research and development (R&D) activities and innovation resources, it has the capacity to restrict or control political exports based on the trade's prevalent economic ideology and the nature of the perceived threat. However, it should be remembered that these activities may be both negative (e.g., weapons prohibitions) and positive (e.g., as a foreign policy instrument to reinforce or gain an ally or enhance partnerships). Thus, first-tier suppliers retain the ultimate benefit of invention, giving them greater leeway to prioritize economic concerns over political considerations, as well as some edge in their offered military systems and weapons.

Finally, it should be noted that if "diffusion and innovation processes" continued at the same rate, first-tier states' technical dominance would never dwindle (Krause, 1992, p. 30). <...> However, as the product cycle progresses, "the marginal return on R&D investment drops and unit costs grow, slowing the innovation process" (Ibid). As a result, the technological gap

between first-tier governments' high-tech armaments and regular customers is slowly vanishing.

Second-tier producers & suppliers

As it was mentioned above, while new military technologies are steadily spreading across the system, first-tier powers are always innovating. However, as the thirst for power grows, so will the need for other states with less inventive power capacities. This tendency, according to Krause, is driven by *political* and *economic factors*. From a political standpoint, he contends that many governments covet power and that developing military strength is an opportunity to acquire great power status. On the economic front, the development of breakthrough technology will significantly enhance the demand for partnership. However, even with a strong political will behind the effort, the author explains that "the unequal distribution of the factor endowments required to capture technological processes means that many technological transplants will fail to bear fruit in their new soil, as states discover that the requirements for participating in the technological revolution are stringent" (Krause, 1992, p. 28-29). Despite the difficulty in creating breakthrough technology, some governments will be able to create various types of weapons, but their domestic demand will be lower than that of first-tier arms producers. These producers will also be limited in other ways by their overall lower factor endowment base, relegating them to the role of *second-tier suppliers*. Krause also believes that economic constraints on the industry would cause the authorities' political concerns to prevail, and that export of technology II (see Section 2.2) via licensing and co-production agreements with downstream users will come to the fore.

As a result, second-tier suppliers could only divulge their military performance at or near the technical frontier. Furthermore, because the weapons manufactured will be tailored to the demands of the maker, these governments cannot be regarded to have a broad acquisition base. Due to the overall features of the production activities, the author concludes that such firms will be reliant on exports or subsidies. Less developed countries will be among the most potential buyers. As a result of this development, the top of the supplier system - first tier- is losing confidence. According to Krause, increased supply chain competition reduces first-tier states' ability to gain political advantage from arms transfers, as some of the most important customers become manufacturing peers, and second-tier manufacturers, driven by the need to

maintain and expand a fragile manufacturing base, export more indiscriminately (Krause, 1992, p. 30-32).

Third-tier producers & suppliers

As a consequence of the adequately competitive environment in the arms production industry, a *third type* of manufacturer is forming, which likewise seeks to expand its imports but lacks any inventive potential. The distinguishing feature of this sort of producer, however, is not their original manufacturing capacity, but rather the effective imitation of already existing technology. Economic and political forces, as in the case of second-tier manufacturers, will be the primary motivators for the growth of the domestic armaments sector. Nonetheless, these motives differ greatly from those of more productive countries."Political reasons will be less directly related to the pursuit of great power status in the international system (since production at the border is out of the question) and more strongly linked to claims to regional hegemony or the desire to lessen reliance on possibly changeable suppliers" (Krause, 1992, p. 29-30). Specific combat requirements are likewise less important, because an alliance with a major power nearly always ensures superior weaponry than can be developed in-house. In terms of economic variables, the key motivator is the prospect of economic progress and the achievement of planned goals and advantages. In such conditions, effective export of weapons will be more important than domestic demand. These comparable export benefits can be seen in specialized areas for unauthorized weapons. Furthermore, in order to obtain better sales results, third-tier governments frequently strive to identify specific weapons systems on which they will work. Such military operations complicate the weapons market and undermine the political usefulness of arms exports.

Thus, Krause argues that, based on the evolving characteristics of the weapons market, the political benefit of managing the arms supply route is dwindling. This, he says, is due to the fast growing number of vendors. As a result, more governments are able to fulfill their own military demands, "and influence is becoming an idiosyncratic byproduct of participation in transitory and unexpected battles rather than a systematic feature" (Krause, 1992, p. 30). Based on the facts presented above, the following information on the structure of the arms transfer system may be compiled (see Figure B).

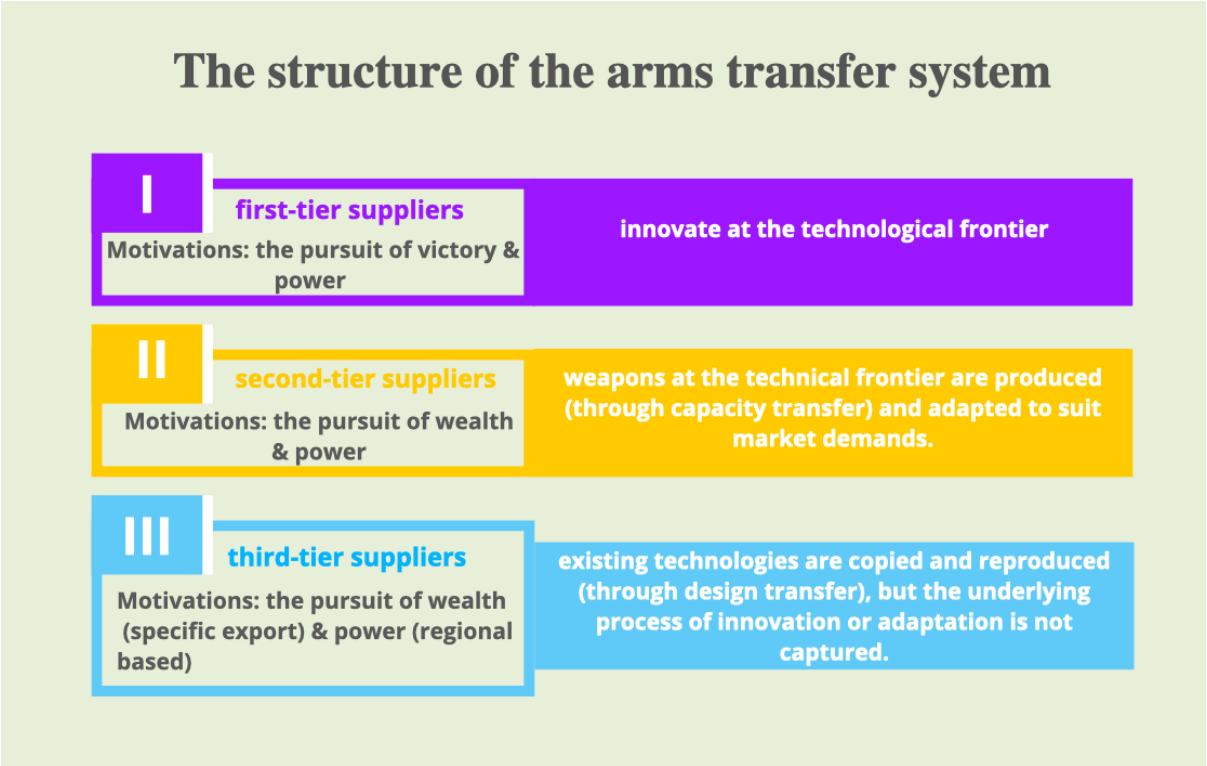

Figure B

To summarize the preceding paradigm, the first-tier governments that invest the most in R&D and domestic markets will create the whole spectrum of contemporary weapon systems (Krause, 1992, p. 31), then becoming the dominant weapon makers while reaching the technological frontier of possibilities. Moreover, it is critical to describe the tendency of weaponry development. The more advanced the technology, the more expensive it is to upgrade it or produce a superior version of it: marginal returns will keep getting lower due to the law of diminishing marginal returns[1]. In fact, when producers are close to their maximum total output, they will have smaller increases in such goods production. Therefore, additional investments would not result in a proportionate increase in output. To address this issue, one option is to compensate for lower increases in production - and thus profits - by exporting the products to third countries.

Some of the arms producers will become top actors, able to create technological means that can have cascading impacts on the other actors. Non-top producers, for example, the second tier, will not be able to compete on the same level of technological competence as exporting

[1] The law of diminishing marginal utility - states that when a good is consumed, total utility increases and marginal utility decreases with each additional unit of good as the consumer is satisfied (saturation of need).

manufacturers at this moment. Such nations' export share would be constrained by their inability to build weapons at the same technological level as first-tier states at the same cost. Increased economic pressure on second-tier suppliers will also indicate a "greater propensity to export the knowledge and skills required to manufacture weapons, in addition to the weapons themselves. Finally, third-tier suppliers will be even more reliant on exports and will find a competitive edge in unique niches for inexpensive and straightforward or easy-to-use weaponry" (Ibid). Their proportion in global production and exports will likewise be restricted

Chapter III. The case of Russia: development of the military sector

3.1 Soviet Union (USSR) militarization processes

It should be noted that the main component of Soviet power was the armed forces, which, it was believed almost throughout the Cold War, were superior to the combined defense capabilities of a global coalition of industrialized democracies. Moreover, some experts believed that the Soviet Union was a superpower mainly because of its ability to constantly generate enormous military power (see Krause, 1992; Korb, 1991). The Soviets had the world's largest and most prolific defense-industrial complex (albeit not the most technologically sophisticated). It has been stated that the Union system's main achievement was in producing vast numbers of weapons. According to Krause, "the motives governing the Soviet Union's arms transfers are similar to those of the United States, but the near-total absence of economic assistance to, and political, social and cultural ties with, client states means the Soviet Union relies even more heavily on arms transfer relationships to achieve its aims" (Krause, 1992, p. 112). According to the released data, the Soviet Union had 5.3 million troops in 1985 (Longley, 2020). It should be noted, however, that estimating Soviet military spending has always been difficult and contentious. This tendency persists to this day, but most estimates place Soviet defense expenditure (in 1980s) between $250 and $300 billion dollars (Steinberg, 1990; Korb, 1991). However, it is worth noting that there is no particular information and statistics on the quantity of productive activity or its aims at the time of the Soviets, and at the moment. Any statistical data is just an approximation of the whole scope of Soviet industry. Furthermore, the material presented is frequently political, as authors attempt to demonstrate that the Soviet Union was the primary supplier of guns to developing nations or the source of all destabilizing shipments (Krause, 1992, p. 112). As a result, the Union was a one-of-a-kind representative of the first set of suppliers, deserving of particular attention.

The Soviet rule arose through a civil war, which the Bolsheviks eventually triumphed over. Starting in 1930, the active expansion of the USSR's economy and diverse sectors was defined by socialism's complete integration. The Union steadily evolved from socialism to communism with the building of socialist society. The process of creating modern economic and defense potential, as well as its overall strengthening, took place in an extremely difficult

environment, when serious deformations in the construction of the new society were taking place, and the totalitarian system was being established and strengthened. The Soviet Union's population was quickly growing, producing reserves for the expansion of productive forces and Soviet Army cadres. In the late 1930s, the Soviet people's efforts were concentrated on implementing the third five-year plan (1938-1942) for the growth of the USSR's national economy. This strategy called for a 92 percent increase in industrial production (Connolly, 1952).

Industrialization, carried out in the years preceding the five-year war, brought the USSR up to level with the world's developed countries. As a consequence of the greatest possible concentration of forces for the development of the industrial base, the USSR's share of global industrial production increased from 4% to 10% by the end of the 1930s (Keefe, 2009). In terms of total industrial production, the USSR was first in Europe and second in the globe; and was also evolving from a backward agricultural country into a sophisticated industrial, economically independent force.

It should be noted that the Nazi attack caught the Soviet armed forces and several parts of the military industry (for example, the aviation industry) in the midst of substantial restructuring and in need of better skills. Furthermore, it became obvious that the Red Army's weapons and technological equipment (between 1939-1940) fell behind the technical equipment of the fascist block armies in various types of military means. Therefore, it became critical to reduce this gap as soon as possible, thus, the motivation to *gain the victory* was defined (first-tier producers' motive). As a result, the USSR shifted its strategic rhetoric to emphasize complete growth of the military industry. In 1941, the state's consolidation of fundamental means of production ensured a quick reorganization of the national economy for military force. The socialist revolution ended the country's reliance on foreign capital and significantly altered the Soviet population's class composition (Connolly, 1952). During the pre-war five-year intervals, a substantial industrial infrastructure for munitions manufacture was established. Aircraft and tank factories were setted up, enormous plants for the manufacturing of artillery weapons and small arms were created and outfitted with cutting-edge technology, and existing military industries were rebuilt (Davies, 1993). All of this allowed for a huge growth in the manufacture of various sorts of military equipment.

A significant contribution was also made to the growth of the metallurgical sector by establishing as many of its own factories as feasible. To satisfy the armed forces' mobilization

demands, Soviet industry had to maintain a continuous level of output of metals, fuel, and other basic resources. For example, ferrous metallurgy was a key military-industrial basis for the Union. Another noteworthy example is the aluminum business. Russia tends to produce 3.4-3.5 million tons of aluminum per year (The NY Times, 2006). Domestic use accounts for around 300,000 tons of aluminum; the remainder is exported. Aluminum output in the Soviet Union was "4 million tons per year" (Ibid). However, because aluminum was deemed a strategic raw commodity, the government prohibited its export. The Soviet defense sector used only about a quarter of the country's aluminum; the rest was used to make consumer items (Rodgers, 1960). The Union's active aluminum manufacturing was a critical strategic move. In the case of a Soviet military mobilization, the defense industry should have had all the resources necessary to swiftly accelerate production of planes, tanks, and other munitions. It is also worth mentioning that the development of the country's economic and defense capabilities was heavily influenced by the status of the chemical sector. During the early stages of industrialisation, the USSR imported a profound amount of different types of chemical goods from outside; but, by the early 1940s, the demands of the national economy were primarily met by domestic manufacture (Luke, 1985). As a result, the USSR was becoming independent of any manufacturers for the development of new technologies or components, which was typical of first-tier arms producers. Furthermore, with such massive amounts of planned overproduction, the Soviet economy had little incentive to boost productivity or cut consumption of defense-related items.

As a result of the Soviet Union's triumph over Nazi Germany in 1945, the Communist rule earned internal legitimacy as well as international credibility. For the following half-century, the Soviet Union's status as the world's second superpower was virtually entirely due to its army, and especially to its nuclear capability. From the second half of the 1940s until the mid-1970s, the principal objective of the Union's arms race was to reduce the gap with the main opponent (the USA) in the field of the most advanced strategic weapons, particularly nuclear-missile systems (Thee, 1976). The competition between the two systems took place particularly in this area. The fundamental underpinning of the arms race was the USSR's genuine lag behind the US in the development of the major categories of strategic weapons between the 1940s and 1960s (Ibid). The Americans were ahead of the Soviets in most categories.

Concerning the USSR's reliance on military technology exports, "until 1955, the only clients for weaponry were satellites in Eastern Europe, North Korea, China, and North Vietnam" (Krause, 1992, p. 115). However, one significant aspect of this collaboration was that the Union exclusively delivered excess weaponry from World War II. Because the political legitimacy of recipient nations was not yet established, Soviet politicians were not interested in large-scale weaponry transfers. In 1955, the first arms deals were signed with Syria and Egypt, thereby making the Soviet Union more active in the international arms market. Additional agreements were swiftly made with nations such as "Yemen (1957), Iraq (1958), Afghanistan (1956), and Indonesia (1958)" (Ibid). The Union military initiative radically altered the proportions of peacetime: military production dominated the allocation of labor and material assets, and the sectors of the military economy collaborated with it. Thus, the Soviet supplier progressively and swiftly increased its influence in the importing nations in order to boost its political image. Furthermore, by being present in Asia and the Middle East, the USSR was able to strengthen its position in the region. As a result, a clear initiative to pursue power was developed, which was typical of the first-tier actors (see Section 2.2).

Finally, the large-scale strategic and conventional arms race between the USSR and the United States in the 1960s and 1970s was a real indication of the existence of the military-industrial complex as a sustained political force. This almost uninterrupted military competition became a breeding ground for the existence of both Soviet and U.S. military initiatives. Thus the international arena of importers witnessed the creation of an arms race between the two superpowers. Both military leaders relied on their motivation to win - *pursuit of the victory* (see Section 2.2). However, between the 1960s -1970s, China burst into the military production race. For the USSR, the Sino-Soviet competition was an important impetus for an even greater build-up of relations with importing countries. For example, the USSR paid special attention to developing revolutionary sentiments in Africa and Asia, which it actively attempted to foster. Furthermore, the Union was vigorously pursuing the construction and expansion of its fleet. As a result, one crucial strategic notion was to interconnect with as many new foreign actors as possible. Thus, a number of agreements were reached with African and Asian nations such as Guinea, Somalia, Egypt, Vietnam, and others (Desfosses, 1987).

The Cold War climate justified this peacetime buildup of both strategic and conventional weapons. The final formation of the MIC as a socio-political force took place in various

conditions and forms in both the USSR and the US, and was completed around the beginning of the 1960s, when the interests of these complexes began to actually dictate the course of both international and domestic political processes in both countries. By the 1970s, the Soviets were still supplying armaments across the world, but they were still hesitant to offer their clients with high-end weapons, and their desirability as a supplier was based largely on their readiness to give huge quantities of weapons swiftly and at a low cost (Krause, 1992, p. 115-116). USSR was able to continue, and in some ways even retain, the potential of the military-industrial complex in the 1990s, owing primarily to the signing of substantial export contracts with a number of nations, including India and China. However, there is a definite pattern in the choice of importing nations, which was shifting owing to changes in the Soviet's foreign policy priorities. As a result, "the Middle East has remained the dominating receiver region since the 1980s, despite the fact that significant clients like Angola, Nicaragua, Afghanistan, and Vietnam have received substantial supplies of weaponry owing to continuous hostilities" (Ibid). As a result, it is critical to emphasize that the USSR's objectives for exporting weapons were strongly tied to its strategic or political goals, rather than economic ones (first-tiers producers characteristics). Nevertheless, following the period between 1990-1995, Russia deliberately reduced its defense budget, and arms exports began to play an important economic role. In order to understand the reasons for such a change, the following section will introduce the discussion on the fall of the Soviet Union and its loss of the leading position in the hierarchy of weapons production.

3.2 Post-Soviet militarisation processes

In the Russian Federation, unlike in the United States and Western Europe, profound changes occurred in the 1990s that were accompanied not by the strengthening and qualitative improvement of the military economy, but by its dramatic weakening, and not by the unification of companies, but by their separation. Russia has now reached a tipping point, as its reserves are mostly depleted and a lack of investment is wreaking havoc on the economy's output. The collapse of the old Soviet fundamentally militarized economy prompted a reform of Russia's military sector, which excluded several highly specialized businesses such as nuclear weapons and missile production (Woolf, 2022). Furthermore, unlike its Soviet predecessor (first tier manufacturer), today's Russian government cannot arbitrarily establish and maintain artificially cheap military equipment costs. The Kremlin cannot also compel

commercial component suppliers and subcontractors to fulfill military instructions against their will. During the Soviet era, large-scale production of modern armaments was enabled by a unique non-market system that prioritized the defense sector with all kinds of resources, including high-quality labor, the best scientists and managers, cutting-edge technology, and guaranteed supplies of raw materials at significantly reduced prices. The elimination of this priority supply scheme after 1991 had a negative impact on the status of the defense industry. Production conversion was successfully completed on a macroscale between 1989 and 1997. When compared to 1991, the output of military items declined by more than tenfold, while the number of people working in the Defense Industry Complex plummeted by more than fivefold (Sokolov, 2009, p. 33; Table C).

The indicators of economic decline in the Russian military industry in 1991-2000 (% to 1991)

INDUSTRY	PRODUCT OUTPUT			
	1991	1994	1999	2000
Aviation	100	36	24	34
Ammunition	100	37	23	28
Conventional weapons	100	43	29	31
Communications	100	32	15	22
Electronic industry	100	26	21	28
Radio industry	100	49	28	36
Shipbuilding	100	58	44	52
Rocket and space industry	100	63	65	67
Overall	100	39.2	25.5	32
Total employment	100	78.2	44.6	45.1

Table C

Translated from Leonovich, 2014, p. 92

There was also a significant fall in the volume of finance - in 1997, compared to 1992, the volume of total investments declined 12.8-fold, and budgetary investments plummeted 35.6-fold (Ibid). Thus, if today's Russian government wants to increase defense production

while adhering to the economic policies of the past decade, it will have to significantly increase budget allocations for military procurement.

In 2000, a number of data on the state of the Russian defense industry were published, which characteristically reflected the extremely difficult situation of the Russian military industry (RAND, 2019). For example, since 1996, the average age of workers in the defense industry has increased from 47 to 58 years (Sokolov, 2009; Leonovich, 2014). Moreover, lots of technologies of armaments production were irrevocably lost, thus losing further opportunities for creating new innovative technologies, which was typical of the Soviet Union as a successful arms producer (Leonovich, 2014). Thus, in view of such large-scale changes in productivity, any attempt to introduce into production new developments created in the defense R&D sector was severely tested. Furthermore, Russia faced new realities in military production as a result of its loss of capabilities as a post-first-tier actor, and the Kremlin was forced to buy cutting-edge foreign technology as well as vast amounts of foreign-made equipment. Also, the necessity to acquire and educate nearly totally new workers for the rehabilitation and expansion of the military sector has grown. However, many of the new recruits did not find the sector to be as profitable or appealing as it had been in the Soviet Union.

Another significant element that harmed Russia's reputation as a first-tier arms producer, and therefore its loss of that status, was its inability to respond to calls to restore or expedite production of current military systems. Many companies in the sector no longer consider military manufacture to be their primary priority (Kazantsev, 2014). Furthermore, several of these businesses shifted to more civilian output. As a result, Russian military manufacturing is no longer an industry separated from the rest of the economy and subject to centralized state administration and supervision, as it was during the Soviet era. With the onset of such a crisis, and possibly a tipping point, the world has seen how the post-Soviet defense industrial complex began to resemble a fragmented enterprise that is part of the defense industrial complex and sees its affiliation as protection from the threat of privatization or possible takeover by more successful companies (Kazantsev, 2014; RAND, 2019).

These issues are exacerbated by a near-complete absence of ideas for reforming Russia's defense sector. This is unsurprising considering that the political class that took power in 1991 desired to have nothing to do with the armed forces or the defense sector (Sokolov,

2009). Furthermore, at the time of the Soviet Union's demise, there was no autonomous and highly established community of defense professionals to which the government could turn. Outside the Ministry of Defense, the number of professionals began to decline as early as 1964, when Nikita Khrushchev was deposed. During his eleven years in leadership, he actively pursued the Soviet Union's dominance over the United States in every imaginable sphere, including the military. At the same time, despite his personal dislike of the military, Khrushchev desired to construct independent sponsored intellectual centers with access to power structures, such as institutes inside the USSR Academy of Sciences. His successors, on the other hand, were believed to have preferred to devote more time to research on foreign defense issues at the General Staff and the Committee for State Security (*Komitet Gosudarstvennoy Bezopasnosti (KGB)*) (Trenin & Miller, 2005, p. 201). As a result, in 1972, the Politburo resolved to close the independent civilian research centers of the Academy of Sciences (Ibid). Following that, the intellectual elite became more preoccupied with business expansion or politics than the military industry.

The negative processes that occurred in the Russian military industry contributed to the severing of cooperative ties within and outside the military-industrial complex; a reduction in most military enterprises' scientific, technical, and production activities; increased depreciation of fixed assets; the loss of critical technologies; unique test bench and testing facilities; and, finally, an outflow of skilled labor resources. As a result, developing an effective strategy for restructuring the Russian army and defense sector proved challenging. The massive resources amassed during the Soviet period gave state authorities hope that the ailing military sector could revive on its own. Now that these resources are mostly depleted, Russia forfeited its ability to be a leader in military technology development as well as to maintain its influential status as a first-tier producer.

3.3 Russia as a second-tier producer

Following the demise of the Soviet Union and its position as a leader in military technology (on par with the United States), Russia sought to safeguard its military production potential through active overseas economic engagement. "In 2009, Russian military goods exports set a new high in the last decade, totaling $8.5 billion" (Zubovich, 2010, p. 58). "By contrast, the

entire value of Russian-made military items shipped in 2008 was $8.35 billion" (Ibid). Russia has also begun to actively conclude big export contracts with India, China, and other nations, as well as to form financial and industrial organizations. The Kremlin presumably took this choice because it considered that expanding markets for Russian-produced military weapons on the global market helped to both the influx of finances into the country's economy and the strengthening of its position on the global political stage. However, due to insufficient financing of enterprises in the military-industrial complex, particularly low levels of R&D and state defense order, the inflow of Russian capital into the military-industrial complex through the export of military products has become the only source of funds that allows individual industries and enterprises to maintain a level that allows them to produce more or less successful technologies (Kazancev, 2014; Leonovich, 2014; RAND, 2019). However, it should be noted that a country's capacity to generate innovative technology reduces its competitiveness. As a result of losing its leadership position in military manufacturing, Russia has sunk to a lower level and has become a representative of the second-tier category. Furthermore, it should be understood that the country's serious shortfall in electronics and information technology, as well as unacceptably low defense industry and R&D financing, have placed it in a difficult situation in which any serious economic or political mistake could bring the state closer to irreversible technological backwardness and even degradation (Trenin & Miller, 2005, p. 119). However, this predicament further underscores the idea that Russia cannot be a representative of the first-tier producers, since it is unable to accept the challenge of the technological revolution.

Under current circumstances, the success of the Russian Federation's foreign economic and foreign trade policy in the area of military exports and military-industrial complex reform is dependent not only on the realization of its innovative potential and the receipt of significant foreign exchange earnings, but also on determining the country's place in modern global politics. The Kremlin believes that, as a traditional commodity provider, growing cooperation in the military-technical domain will help them to emerge as a successful member of the civilian high-tech goods market. As a result, in the interests of the Russian armed forces, the Russian government has sufficiently expanded appropriations to the state defense order. In 2013, 1.5 trillion rubles were allocated to the defense order, i.e. twice as much as in 2012 and five times as much as in 2007 (Leonovich, 2014, p. 94). Moreover, at the initiative of the Kremlin, a more specific notion of military-industrial complex (MIC) began to be used. According to the ruling elite, MIC is one of the main elements of the country's state and

political system, consisting of three interrelated components: industrial and economic (defense industries and enterprises), military (army, defense ministry, generals), state and political (representatives of legislative and executive authorities, political parties and movements) with subordination to the highest state leadership (Maltsev & Azarov, 2014, p. 59). It is worth noting that the military-industrial complex is actively integrated into the sphere of television, radio broadcasting, communications, optical instrumentation, electronic equipment and a number of other important areas that have a significant impact on the socio-economic situation in Russia as a whole and largely determine the industrial and technological level of the country itself (Ibid).

Despite the precision of the term MIC's definition, the state and interdepartmental organizations are incapable of providing the essential management of this complex. Furthermore, it is difficult to determine where the funds allocated for the needs of the state defense order. As a result, MIC structure change is proceeding slowly and randomly. The price policy does not allow for the full implementation of the intended indicators outlined in the State Armament Program. Furthermore, there is no funding or support for the technological cycles required for the quality development, production, and upgrade of military equipment. As a result, Russia has no potential to develop new technology, simply to enhance current ones in some way (Trenin & Miller, 2005). As previously stated, one of the major issues in analyzing the Russian Armed Forces is a lack of particular statistics on weapon purchase or manufacture. According to Rostec, the level of modern equipment in the Russian army in 2013 was just 16%, however during the implementation of the state armament development program 2020, the proportion of contemporary weaponry doubled and reached over 68 % (Rostec, 2020). Above all, this 68 % includes active development of the Air Force, which, according to the same source, has more than 3 thousand aircrafts (from 2013 to 2018 the number was only 1000) (Ibid). Thus, the development of the military industry develops horizontally rather than vertically (increase in quantitative output or the rudimentary upgrading of previously existing technologies and their components, with no additional technical breakthrough), as is common for the second-tier group.

It is also worth noting that the Kremlin has taken the initiative to boost military enterprises by establishing state firms. *Oboronprom United Industrial Corporation* (OPK) was established in 2002. The corporation's principal activities were helicopter and engine production, air

defense systems, advanced radio-electronic complexes, and other machine-building assets (Maltsev & Azarov, 2014, p. 59). Since 2006, the Oboronprom Corporation has included Russian Helicopters, which brings together all of the major Russian helicopter developers and manufacturers. The United Aircraft Corporation (UAC) (*Obyedinyonnaya Aviastroitelnaya Korporatsiya*) was founded in 2006, while the United Shipbuilding Corporation was founded in 2007 (Ibid).

Simultaneously, the main efforts of the researchers began to be aimed at summarizing the results of the activity of the military sector that aims to address the economic needs. At the same time it is necessary to understand that reliable and actual information connected with the activity of subjects of military-technical cooperation is not always disclosed and remains the prerogative of politicians, military and specialists engaged in this sphere. In this regard, the analysis of the situation on the global market for weapons and military equipment, as well as the definition of Russia's place and role on it, as well as the development of proposals to improve the level of competitiveness and efficiency of military product promotion on the global market in modern economic conditions, are particularly important.

As it was mentioned before, the Kremlin is expanding its military weaponry worldwide to positively affect the inflow of funds into the country's economy and improve the country's position on the global political scene.

However, the *pursuit of power* and *economic prosperity* is not the only push factor for Russia to build up its military capabilities. In fact, even if the Russian political elite seeks to increase its level of influence over importing countries in order to successfully achieve its foreign policy goals, the Kremlin's rhetoric on this topic has characteristically changed in recent years. It is possible to observe an increased desire for victory and a kind of primacy in the military industry. This trend has been especially evident since 2018, when the current President Vladimir Putin actively spoke out about the integration and proactive development of Artificial Intelligence in the military. By following such an innovation, Russia has actually brought itself into the production race on its own, along with representatives of the first-tier groups like China and the US. Thus, the question arises, is it possible that a representative of the second-tier group of manufacturers with the active development of a certain branch of military technology could be able to be on an equal footing with the leaders in the production of weapons? The next section (Chapter IV) will open the discussion on the introduction of Artificial Intelligence in the military sphere, namely the active production and development

of autonomous and semi-autonomous weapons systems by Russia. Then Chapter V will follow an analytical discussion of whether the second tier producer can become a first-tier one by identifying its motivation similar to the top actors of the arms production hierarchy (Krause, 1992).

Chapter IV. AI section: the rise of production of weaponized AI intelligence

4.1 The development of AI in the military field

The evolution of the military is as closely linked to the development of technology as any other area of public or social life. Over the past decade, the world has witnessed an acceleration in the emergence of technologies capable of giving conventional weapons the unique capabilities of combat robots. The UN has coined the term lethal autonomous systems for such weapons. It refers to weapons capable of engaging targets on the ground, in the air, on water and underwater without human involvement. To date, there have been heated debates about the prospects of AWS being used for military purposes, which are to some extent equipped with Artificial Intelligence and in the future will be able to make decisions independently. The deployment of this type of weapon is still new to the international agenda, and lies at the intersection of political, legal, technological and ethical-moral considerations. Nevertheless, in order to understand how these systems emerge it is important to trace the development of the field of Artificial Intelligence itself.

To begin with, the ambition for scientific and technical growth, as well as the fluctuating stability of industrialized nations' foreign policy ties, drive the world society to a type of adversarial process of developing more and more powerful military implements. It should be noted that "although a term used since the 1950s, Artificial Intelligence has still not a generally accepted definition today" (Szabadfoldi, 2021, p. 158). "It cannot be interpreted as a stand-alone application, but as a technology that supports existing functional applications and is eventually based on algorithms designed to solve specific problems, collecting, organizing, processing, analyzing, transmitting, and responding to larger data sets, suitable and capable of corresponding to the cognitive ability of the human intellect, and operations approaching it" (Ibid). Between 1943 and 1955, the "prerequisites for the emergence of AI" were largely defined by an article that cited a model of artificial neurons, and a paper by Alan Turing in *Computing Machinery and Intelligence* that described the Turing test, principles of Machine Learning, genetic algorithms, and the reinforcement learning process (Turing, 1950). Nevertheless, the sphere of development of Artificial Intelligence was still rather limited precisely to modeling creativity, self-improvement, use of natural language and, most importantly, creation of computer systems acting autonomously in a complex, changing environment. A number of programmes were created aimed at modeling human

problem-solving procedures such as Logic Theorist, General Problem Solver or Geometry Theorem Prover. Following the 1950s, the US and Soviet militaries were among the first to address the issue of new technology in connection to planning duties. The Defense Advanced Research Projects Agency (then ARPA, today's abbreviation is DARPA) investigated the application of AI technology for military reasons in the 1960s. However, the use of AI in the military area was still considered as a long-term project with the major focus on the creation of heuristic programming and the continued development of neural networks based on the notion of perceptrons.

Since the early 1970s, enthusiasm in the creation of Artificial Intelligence has been fueled mostly by experts' and government leaders' overestimation of its true usefulness. There was a certain tendency of insolubility in proving theorems based not on units, but on tens of axioms, machine translation of texts (especially Soviet articles about space), application of neural networks to solve real problems, etc. The reasons for this intractability were the small amount of knowledge about the subject area in AI programs and the use of only formal syntactic manipulations. In addition, the programs were mainly laid down procedures for checking various combinations of possible steps, which is effective for a small number of variants. According to Jim Howe's article on *Artificial Intelligence at Edinburgh University: a perspective*, the Lighthill Report, published in 1973, caused a huge loss of trust in AI among the academic elite in the United Kingdom (and to a lesser extent in the United States) (Howe, 2007). "It lasted a decade, the so-called AI Winter" (Ibid). However, "in the early 1980s, Japan saw Artificial Intelligence's potential and re-invested in the area" (Nield, 2019). According to Russell and Norvig, the AI sector increased from a few million dollars in 1980 to billions of dollars in 1988 (Russell & Norvig, 2003). Only then did Artificial Intelligence's popularity begin to dwindle.

With the advent of the fourth technology revolution in the 2000s, interest in Artificial Intelligence has been actively expanding, as has financing for government AI programs. Klaus Martin Schwab, the World Economic Forum's founder and president, defined this historical era as a fundamentally new stage in human history, with the ability to actively reshape the political system, economic structures, and human society (Schwab, 2018). Moreover, Barno (2018) believes that the fourth industrial revolution's increased potential would result in dramatic changes in the way countries battle. Even if there is still some level

of skepticism among scientists, it cannot be ruled out that AI will have a revolutionary influence.

This inventive era, which is still ongoing, is distinguished by the evolution of Artificial Intelligence into a science. This is due, first and foremost, to the fact that contemporary AI approaches are founded on strong theorems and verifiable experimental evidence (e.g., speech recognition using rigorously grounded hidden *Markov models*) (Buchanan, Hendriks-Jansen & Addis 1994). Second, these methods are widely used in real-world practical applications such as pattern recognition by neural networks (e.g., technical vision of robots); analysis of hidden patterns by genetic algorithms (e.g., management, business analysis); fuzzy control of technical systems (e.g., automatic regulators of technical systems) and information search on the Internet by intelligent agents (e.g., bots). There was also a progressive shift from the notion of *thinking like a human*, which was used to model mental processes, to *acting like a human*, which was used to react sensibly in various scenarios. Furthermore, how AI began to use specific procedures, much like any other well-established science. For example, the limitations and boundaries of achievement began to be defined, and it is now recognized that creating a universal issue solution is, in principle, impossible.

When it comes to the current implication of Artificial Intelligence is military matters, such systems are currently employed in the administration of military construction, day-to-day operations of troops and maintaining combat preparedness, weapon system development, and many other fields. One of the most promising areas in this domain is the potential for robotic systems to autonomously recognize and track targets and, as a result, make an autonomous choice to engage. The United States is one example of a country developing such military systems. "Some future Army counter-battery systems may be able to autonomously destroy incoming artillery and missile barrages at speeds faster than humans could possibly perform" (Thurnher, 2012, p. 79).

Nevertheless, it is worth noting that there are now significant concerns in the use of AI military systems that are linked with the exponential rise of information volumes, its unpredictability, and inadequate structure. Considering the psychophysiological, cognitive, and other limitations of human capabilities (the decision maker), as well as the limited role of automation in decision making (only in algorithmic, formalized situations), there is a need to use intelligent systems for real-time planning and management of daily and combat activities

in a dynamic environment, with the ability to convert unstructured data sets into knowledge that is ready for direct application (Bosch & Bronkhorst, 2018).

Another area of application of AI in military affairs could be the development of high calculating systems and technologies such as self-training computer systems for processing unstructured information on modern and advanced materials, highly productive, intelligent software and hardware complexes of creating defense equipment, adaptable to current situational parameters, changing properties under the influence of modern weapons, and so on (Ibid; Kozyulin, 2019). Additionally, movement control, fire application, concealment, and protection developed now with the use of "technical vision" will be further improved in the future, leading to autonomous functioning not only of separate samples and complexes of technological and armed systems, such as onboard control systems of moving objects, including precision weapons; reconnaissance-strike systems; integrated monitoring systems (intelligence and control); air and missile systems (The UN, 2019).

Moreover, increasing emphasis is being placed on developing intellectual image analysis technologies as well as the development of technical vision via the creation of techniques and algorithms for analyzing the properties of models based on a small number of observations (Bayoudh, Knani, & Hamdaoui, 2021). Radar surveillance technologies based on sophisticated ways of processing information from low-frequency radars, allowing to recognize the smallest indicators of targets in the reflected radar signals, will be equally essential in the near future. Last but not least, decision-making systems for repelling enemy attacks - self-training systems for analyzing the fact and method of enemy attack, assessing the composition and characteristics of the weapons used, the parameters of the impact points, losses of forces and resources, determining the method of effective countermeasures - appear to be of particular importance in the current military affairs.

Nevertheless, it should be noted that adapting to the changing character of warfare, according to academics, is a huge problem for state and military officials. The deployment of fourth-generation military technologies, which are not adequately covered by international law, may result in unmanageable environmental risks. According to analysts, the biggest worry is that advancements of AI in the military may lead to the elimination of humans as a part of the decision-making process. The following section will address the possible ethical and legal consequences of creating and employing AI in the military.

4.2 Types of weaponized AI

As it was mentioned earlier, the central focus of this work will be addressing the rise of lethal autonomous weapons systems usage. Following the previous parts, the Artificial Intelligence can be named as a type of program that, through its intelligent components, is capable of doing laborious tasks in both the real and virtual sense. However, in the case of the proper interpretation of the meaning of AWS, it is first necessary to understand how the term should be interpreted. Most theoretical debates on the subject often focus on the term ***weapon***, which should be interpreted as a tool that causes damage or harm in a direct way. An example would be an individual weapon, such as a mine, missile, machine gun or dynamite. In turn, the meaning of the word ***systems*** in this paper refers to some intermediate platform from which real weapons are deployed, such as aircraft, military vehicles and other means of transportation. Additionally, "system may be considered roughly synonymous with means of warfare as that phrase is used in various legal instruments" (McFarland, 2015, p. 1315). This perspective is justified in terms of the availability of technology that can be "integrated into military gear and software that would not ordinarily be categorized as weapons, but may nonetheless effect combat operations in a manner comparable to autonomous weapons capabilities" (Ibid). "Various types of autonomous intelligence, surveillance, and reconnaissance (ISR) systems, for example, which use sensors mounted on UAVs, satellites, ships, or other platforms to collect and process information about potential targets before providing it to the human weapon operator, can play a similar role in the decision to fire as the weapon system's autonomous decision-making system" (Ibid).

The second definitional statement pertains to the various ***levels of autonomy*** that can exist in AWSs According to Tim McFarland, "systems are called ***automated*** when they can only perform low-level tasks without assistance or when they are restricted to a rigid repetitive operating routine defined by fixed programmed procedures, and ***autonomous*** when they can receive higher-level instructions and appear to have some degree of choice or ability to make decisions in determining how to perform those instructions" (McFarland, 2015, p. 1315-1316). The concept of ***autonomous*** is obviously quite wide and incorporates, to some extent, system analysis, operations research, decision-making theory, management, and other formal methodologies. At the same hand, circumstances that are not offered by algorithms and are not specified using formal methods are not accessible to automation. This might serve as the foundation for defining automation as an algorithmic process of decision-making

assistance in a restricted number of specified scenarios. McFarland believes that the interpretation of the concept of autonomous ideas is problematic since identifying important distinctions in practice is challenging. As a result, he argues that AWS typically overlap and are not segregated into distinct groups.

This research, however, attempts to separate systems based on their varied degrees of autonomy. Machine-human interaction is defined using a variety of terminology. Furthermore, Human Rights Watch agrees with this statement and argues that several types of autonomous weapon systems exist based on their level of autonomy (see HRW, 2012) and the amount of human involvement in them. The classification can be introduced as such

1. **Human-*in*-the-Loop Weapons**: Robots that can only be directed by a human to choose targets and administer force; Examples: any type of RCPs;
2. **Human-*on*-the-Loop Weapons (semi-autonomous)**: Robots that can pick targets and apply force while being overseen by a human operator who has the ability to overrule the robots' activities; Examples: Patriot, S300, S400;
3. **Human-*out-of*-the-Loop Weapons (autonomous)**: Robots that can choose targets and apply force without the need for human intervention or contact; Examples: sentry gun Samsung SGR-A1, US NAVY´s Phalanx system and others;
4. **Human -*beyond*- the Loop Weapons:** Robots with high AI characteristics and the ability to function with human-like intelligence; Do not yet exist, but predecessors are currently in use.

It should be noted that in this context, the term ***robot*** refers to the three categories of unmanned weaponry outlined above. In other words, anything involving remotely piloted drones and fully autonomous weaponry (Ibid). The degree of legal accountability for damage produced by such systems will be precisely proportional to the level of autonomy. The degree of autonomy, however, will not be a sufficient criterion for categorization. The amount of autonomy of combat systems generated in various countries will differ due to variances in weapon platforms and technical advancement. Moreover, it is important to understand that the term "totally autonomous weapon" applies to both out-of-the-loop weapons and those that enable a person on the loop but are essentially out-of-the-loop weapons" due to the restricted oversight (Ibid; US Department of the Treasury, 2014). Finally, the definitions ***lethal autonomous robots*** and ***killer robots*** have been equally used to describe fully autonomous weaponry.

Another criterion for defining AWSs is their intended theater of operations, which may be classified into air, sea, and land-based. Such weapons' validity must be evaluated at the international level within the context of humanitarian law and related treaties. The classification of AWS is critical for controlling their military usage and legal culpability for damages, however there are presently no widely agreed rules and criteria in this domain. Today, a huge number of countries are attempting to build completely autonomous armament capable of responding autonomously to any posed dangers. "Other antecedents to fully autonomous weapons, either deployed or in development, include anti-personnel functions and are meant to be mobile and offensive weapons in some circumstances" (HRW, 2012). Because such weapons may create positive outcomes in battle, their creation is a strong signal of arms technological capacity. There is a decrease in casualties as well as an improvement in the success of the response procedure.

4.3 The systematic use of the weaponized AI at the global market

To successfully talk about autonomous weapons, one must first understand which functions are - or can be - automated and which share authority with a human operator. When talking about specific applications of AI in military affairs, it is worth noting that at the moment there are significant problems related to the processing of received information and poor structuring. Therefore, at this stage, the possibility of using intelligent real-time planning and control systems in a dynamic environment is particularly relevant. According to SIPRI, "the largest producers of arms in the world are namely, the USA, the UK, Russia, France, Italy, Japan, Israel, South Korea, Germany, India, Sweden and China" (SIPRI, 2017, p. 19). In doing so, special attention is paid to the possibility of human presence in the final choice of target and of course the decision to apply further actions.

To begin with, guidance and navigation functions have long been automated (e.g. autopiloting aircraft or drones). However, more sensitive are the automatic target identification and engagement functions (i.e. opening fire). This type of software does not yet fully identify the presence of civilians. Therefore, such systems still require human control. It should be noted that today Korea is one of the few countries that actively seeks to build its innovation capacity. For example, attempts have been made since 2003 to create the Samsung

SGR-A1 automated turret. "This robot uses a low-light camera and pattern recognition software to distinguish humans from animals or other objects and, if necessary, can fire its built in machine gun-a Daewoo K3" (Kumagai, 2007; Kashif, Arslan, Chakma, Banoori, Al-Mamun & Chakma, 2018). The *SGR-A1* is capable of detecting multiple targets by means of an extensive arsenal of cameras, thermal sensors and motion detectors. The robot's primary mission is to take over from the border patrol guards currently deployed around the DMZ on the Korean peninsula. It is claimed that the use of such a system will help reduce the number of possible casualties from South Korea's side in case its relations with North Korea will unexpectedly deteriorate. A similar automated turret system is also being actively developed by the US, namely *Tower Hawk*, which should completely replace observation towers on military bases in the next few years (Szondy, 2015). The system also aims to be controlled remotely by a soldier-operator.

Moreover, one of the best known types of AWSs is also the various types of unmanned aerial vehicles (UAVs). UAVs refer to all unmanned aircraft, including those whose flight is pre-programmed on the ground and cannot be adjusted by the operator while it is in progress. Remotely piloted vehicles can fly both according to a pre-programmed route into the flight computer memory and according to corrective commands from the operator. "The most important task of military drones is reconnaissance and surveillance from the air" (IIWORKS, 2021). They patrol territory, guard routes, and can work as fire spotters. At the moment, the US remains the world leader in military drones, but it is also worth realizing that there are more active players in the global market, bridging the gap that existed a few years ago in innovation and pioneering activity. Such military manufacturers include, above all, China and Turkey. Israel also remains highly active in the international military drone market.

Most US military drones today are intended for use against countries without air defenses, or after air defenses have been suppressed (Report to Congressional Requesters, 2001). Some of the most successful US drones are the *GAAS Avenger* and the *MQ-9 Reaper,* which are not available for export (only the *CH-4* reconnaissance strike counterpart). Israel is also one of the active developers of a variety of military drones, which are then actively exported. These are mainly reconnaissance-type UAVs, as well as barraging munitions. As an example, a type of drone such as the Israeli *Heron- TP* should be highlighted. However, the modern Turkish *Bayraktar TB2* is considered to be better than its Israeli counterpart due to its exceptional software. The quality of Turkish strike drones is confirmed by the experience of their use on

the territory of Syria, Libya and the unrecognized Nagorno-Karabakh Republic (NKR) (Crino & Dreby, 2020; Fahim, 2020; Insight Turkey, 2021). Also, the *Bayraktar TB2* is being exported to Qatar, Tunisia, Ukraine and Azerbaijan, while negotiations are underway with Serbia, Egypt, Saudi Arabia and Pakistan (MEMO, 2021). As for the development and production of drones, China (one of the major countries with high innovation potential), the *CH-5* (or *Rainbow-5*) is considered to be China's most powerful drone. However, in the case of Beijing, it should be understood that the true success of their UAVs should only be judged by intelligence groups, as the country does not publicly flaunt its military innovations. It is also worth noting that China is making efforts to narrow the technology gap between military drones and US drones, as well as increasing their number. Since 2015, Beijing has banned the export of its most advanced military drones (Blanchard, 2015). However, little more information on China's military capability is accessible to the public. Such little information on drone exports and performance may also be found in Russia. To date, the Kremlin has been engaged in creating prospective strike UAVs, but no evidence of their readiness or serial manufacturing has been provided.

Also among the autonomous or semi-autonomous weapons are various types of anti-aircraft systems. One of the most successful systems on the market is the American systems *Patriot* and *THAAD*, which are designed to protect strategic ground facilities and equipment from air attack. Also worth mentioning is *SAMP-T,* which is a modern French-Italian project to protect mechanized ground forces and other targets from air attack. Israel also has various successful air defense systems, today especially noteworthy is *David's Sling* which is designed to defend against large caliber ballistic missiles and unguided rockets.

Also, the focus of many weapons manufacturers is on developing more sophisticated systems for recognising difficult targets (e.g. fighters *vs* wounded in combat) and environments that are themselves quite complex (e.g. progressively escalating conflict situations) and the ability to engage such targets based solely on this intelligence. At this point, technologies already exist that make it possible to create lethal autonomous systems. Nevertheless, they are not yet advanced enough to create effective mobile ground-based AWSs, but stationary combat robots already exist. Examples include the semi-autonomous *Katlanit* robotic machine gun towers in Israel, the *Samsung SGR-A1* in South Korea or the *Common Remotely Operated Weapon Station* in the US. These autonomous weapons are able to destroy a target, provided that it conforms to the image programmed into it. Only moral principles limit their use.

Moreover, all manufacturers claim that they request confirmation from the commander before attacking, thus indicating that these machine guns comply with semi-autonomous principles. Another example is the *Harpy* autonomous ammunition made by *Israel Aerospace Industries* (*IAI*). The developer endowed it with the ability to recognize and destroy enemy armored vehicles on its own. However, the initiative caused a high public outcry due to the lack of an operator capable of correcting the system's decision. Following the public outcry, *IAI* produced an improved version of the projectile called *Harpy-2* (or *Harop*). This self-guided projectile requests for instructions from the operator before attacking, making it a semi-autonomous weapon rather than an autonomous weapon. Nonetheless, despite the huge desire to approach the development of completely autonomous weapons, there are several concerns regarding compliance with the values of humanism and proportionality (adequacy between the means used and the desired effect). As a result, many weapons that were initially intended to be autonomous are progressively becoming semi-autonomous. However, it is important to mention that the use of any type of AWS presents legal, ethical, and moral concerns that are shared by the whole worldwide society, not just specialists and governments (The UN, 2019). Most governments support the prohibition of AWSs due to the threat they pose to international security, while others emphasize the possible benefits of how future battles would be waged and regard any legal regulation choices as premature. Moreover, keeping meaningful human control over the use of force is an ethical need, a legal requirement, and a moral duty. The part that follows will discuss the ethical and legal issues of producing and employing AI in the military.

4.4 The ethical and legal implications of developing and using AI in the military

"The primary challenge to multilateral governance of military AI is uncertainty—uncertainty about how Artificial Intelligence will be used, uncertainty about whether current international law adequately captures the problems that use of AI may generate, and uncertainty about the appropriate venues for advancing the development of governance approaches for military applications of AI" (The UN, 2019, p. 5). In 2014, international diplomats, disarmament specialists, and civil society leaders began debating autonomous weapons. These informal meetings recently turned into official agreements. While completely self-directed weapons have yet to be developed, numerous countries are substantially investing in the adaptation of Artificial Intelligence technologies for military application. Along with this present increase in R&D in the field of military AI development, there is a rising discussion in the

international community concerning the ethics and validity of developing and employing these systems. "The Convention on Certain Conventional Weapons (CCW) in Geneva, for example, is projected to become the primary worldwide intergovernmental debate venue for resolving critical challenges resulting from the advent of new technologies in the field of AWS" (Altmann & Sauer, 2017, p. 132 in Hynek & Solovyeva, 2020, p. 79). Furthermore, the *Stop Killer Robots Campaign* is "the latest in a series of global humanitarian disarmament advocacy initiatives" (Carpenter, 2016, p. 58) that has succeeded in uniting over a hundred non-governmental organizations (NGOs) in the battle against the use of AI in the military sector.

"The autonomy of the computer in life-and-death choices" is now the most passionately contested quality in the employment of Artificial Intelligence in today's forms of military technology (Hynek & Solovyeva, 2020, p. 79-80). Many analysts point to dangers to the military application of AI that are influenced by the drastic decrease of time for strategic decision-making inside military command and control, communications, and intelligence gathering and analysis systems. Different academics tend to indicate that AI weapons have the potential to affect "military institutions as well as battle philosophy" (The UN, 2019, p. 5). As a result, it alters the allocation of human and equipment resources employed in conflict. Furthermore, we should note that Artificial Intelligence might alter the pace of operations, which would paradoxically increase and decrease the time it takes to make a choice (Ibid).

Furthermore, some argue that self-guided devices are incapable of distinguishing between civilians and military personnel. Professor Christof Heyns, the UN Special Rapporteur on Extrajudicial or Arbitrary Executions, stated in a 2013 report that the existence of AWS "raises wide concerns regarding the protection of human life in times of conflict and peace"" (OHCHR, 2013, p. 1). According to the research, because a suitable system of legal responsibility cannot be developed and machines should not have control over human life and death, the deployment of autonomous weapons may be unethical (Ibid). It should be noted that due to the failure of the deployed smart system to identify the proper target, there is a considerable danger of deadly effects, and such acts may afterwards breach international humanitarian law, which functions in armed situations and is meant to protect civilians as much as possible. Therefore, "given potential humanitarian risks, critics call for a *preventive*,

or rather *preemptive*, global ban on their development, production and use" (HRW, 2016; Ibid).

Nowadays, 26 countries, including Australia, China, and Brazil, have called for a freeze on autonomous weapons systems. However, there are also other international actors that tend to believe that the above-mentioned risks are more closely tied to a full prohibition on sophisticated autonomy in military systems. States that are actively investing in the use of Artificial Intelligence for military purposes, such as the United States, Israel, Russia and the United Kingdom, oppose the ban. Furthermore, the National Defense Authorization Act for 2019 says that the employment of "non-traditional technology," including AI, by the US military is fully permissible to boost the country's defense capabilities (NDAA FY, 2019). The viability of forming collaborations between government agencies and industry, academia, and private enterprises to develop and apply AI and Machine Learning technologies for the demands of the United States Department of Defense is also lauded. It is worth mentioning that many observers believe that the success of Artificial Intelligence research for military reasons in the United States is governed, among other things, by the capacity to reach a moral and ethical compromise between politicians and AI scientists. As a result, as a stopgap solution, Washington deliberately involves more loyal, but less successful, corporations in several projects.

In general, rapid and ill-considered military breakthroughs in AI may result in a new weapons race and a creeping disrespect for international law's norms and principles. There is a risk of one country acquiring technical and military supremacy, limiting openness of military projects, and spreading harmful technology to non-state actors. All of this can lead to increasing instability and the escalation of a wide range of issues for mankind.

4.5 The limitations of AI development in defense sector

"Within a decade, Artificial Intelligence, especially the subfields of Machine Learning (ML) and Deep Learning (DL), has progressed from prototyping at research institutions and universities to industry and real-world application" (Svenmarck, Luotsinen, Nilsson, & Schubert, 2018, p. 1). At the same time, defense development is one of the most critical goals that each state must do. Furthermore, each government aspires to improve its military capabilities, particularly its defense ones. In turn, Artificial Intelligence is one of the most important branches of science that is actively being developed and is being employed by a

wide range of global entities. The usefulness of AI's capacity to use and process massive volumes of data cannot be discounted. This skill is especially valuable in the military area because, as computer and decision-making capabilities increase, such systems gain successful self-control and consciousness skills. "AI capabilities exist in all domains (i.e., land, sea, air, space, and information) and at all stages of conflict in the military environment" (i.e. political, strategic, operational and tactical) (Svenmarck, Luotsinen, Nilsson, & Schubert, 2018, p. 1). However, AI, like every scientific discipline, has its obstacles and even hazards of application. Specifically, this section will address key limitations of AI development in the defense sector such as *transparency laws* and *limited learning principles* along with low *optimization possibilities*.

To begin with, AI will be effective only if it instills trust in the accuracy of its activities. As a result, every intelligent system's actions must first and foremost be explainable and transparent. However, it is important to recognize that, from an ethical standpoint, the concept of AI transparency, as well as the idea of explaining algorithms and automated judgments, remain among the key difficulties. Artificial Intelligence systems must be verifiable, comprehensible, and intelligible to individuals with varying degrees of expertise, according to technological transparency. Furthermore, in the military context, transparency first and foremost entails the understandability of a program's conclusion without violating normative and ethical principles. Also, there may be deeper knowledge and further information regarding the system and how it operates. In practice the transparency issue can be seen in case of the feature visualization or at the battlefield where the AI cannot go beyond its already pre-written system recommendations, thus not being able to adapt to the vastly changing environment.

However, it should be understood that disclosure of information related to AI and its systems is not without risks; information published may make AI more vulnerable to attack, and countries that use these systems, being transparent, may be more susceptible to external risks. This is why many countries rely on semi-autonomous Artificial Intelligence systems in the military sphere. In most cases, the types of AI used are still sort of experimental. Transparency will therefore need to be addressed in order to move from these pilot projects to larger-scale implementations. According to the Swedish Defense Research Agency, there are two ways to make AI systems transparent (Svenmarck, Luotsinen, Nilsson, & Schubert, 2018, p. 5). Firstly, "some models, such as linear models, rule-based systems, or decision

trees, are thought to be more interpretable than others" (Ibid). As a result, any interpretation of this type of model offers a tangible knowledge of where the system obtains its information and how it is processed. In this situation, interpretability is determined by users' ability to forecast system suggestions, comprehend model parameters, and comprehend the learning method. Secondly, conditions must be established in which the AI is capable of expressing its suggestions (Svenmarck, Luotsinen, Nilsson, & Schubert, 2018, p. 5). However, it would be more productive to create situations in which the system could self-report even its anomalous activities, allowing us to find solutions to reduce risks and enhance our actions and judgments.

"From an operational standpoint, the most noticeable obstacle of expanding weapon autonomy is the necessity for predictability and understanding of the system's behavior" (Hagstrom, 2019, p. 35 in SIPRI, 2019; SIPRI, 2017). As it was mentioned earlier, AI systems are quite limited in their learning principles (especially in the case of using ML-based systems). It should be emphasized at the outset that Machine Learning in the context of military development is a complex case. The very process of data collection in ML-based systems is initially quite difficult to apply in the defense sector, since this method does not include the ability to quickly perceive new information and adapt to factors that are not laid down by the program. Machine Learning, on the other hand, is based on a pre-programmed algorithm of activities, and hence has no ability to learn on its own. Even a well-functioning mathematical model that uses valid data might be deceived if someone understands how it works. "In an armed confrontation, a commander's choice to use force must adhere to the fundamental principles of international humanitarian law, as well as understanding the impacts of a weapon and being able to predict how it would behave once launched" (Ibid). Because ML-based systems do not go beyond their built-in algorithm, they are frequently subject to attacker countermeasures. Rapid adaptation of the actor's military power to successfully respond to the opponent's aggressiveness is critical in a military engagement. As a result, the use of ML in a conflict situation or vice versa with strategic planning is quite restricted and difficult. Finally, it must be inferred that there are operational issues when incorporating Machine Learning techniques into weapon system design. A weapon system's impact should be predictable for the operator but not for the enemy.

Meanwhile, in the case of Deep Learning, more complex neural networks with multiple neurons and layers are used. Increased computational power and advanced techniques are

used to train these deep neural networks, as well as to detect complex patterns in huge data sets. Thus, on a practical level, a military DL system has the ability to make more accurate decisions and adapt to different variables. However, it is worth realizing that the robustness of any programme can be determined if minor changes to the input data do not alter the result. At this point there is a high risk that DL systems will make decisions which unfortunately can lead to more casualties. This is why the presence of an operator at this stage in the application of AI military technology is mandatory (semi-autonomous AWSs). Thus, even with more advanced algorithms the DL-system still needs the presence of a person responsible for the final decision. Thus, it is worth realizing that even if AI is actively being integrated into the military sphere, unfortunately it has not yet achieved its full success at this stage of development. In the next chapter, this topic will be developed, however, using the specific example of a weapon manufacturer that is actively seeking to implement AI - the Russian Federation.

Chapter V Analytical section on AI: Russia's placement in arms production hierarchy

5.1 The context of Russian development of weaponized AI

The analysis of Russia's military development should begin with an examination of the organizations, military philosophies, people, and weaponry that Russia acquired from the Soviet Union. This is a remnant from a time when Moscow possessed a massive military power by international standards. The West believed in the early 1980s that the Soviets had gained military dominance. At the time, the Soviet Union's conventional armed forces were backed up by a massive nuclear capacity that encompassed tens of thousands of warheads and tens of thousands of delivery systems. When the Union began its rapid and unexpected decline in 1991, these accumulated investments and resources in the military complex were both a significant stake in the unfolding drama of the country's collapse and a source of great concern to all observers of the empire's demise. As a result of the quick and mostly uncontrolled process of the breakdown of the Soviet military system and the establishment of national armed forces in the fifteen newly independent republics of the former Soviet Union, Russia inherited its armed forces.

The Kremlin was forced to develop security policies and military capabilities that responded to the new reality. All this had to be done within the framework of a very difficult transition process that began after the collapse of the Soviet Union. Russia experienced political turbulence, social cataclysms, and a deep economic recession (Berls, 2021). The protracted economic crisis primarily and most adversely affected Russia's ability to preserve, maintain and sustain the military capabilities inherited from the Soviet Union. Moreover, reserves have largely dried up, and the lack of investment is having an increasingly heavy toll on the economy's productivity. Thus, for more than half a century, the Kremlin has diverted all the best technology, material and human resources to the military, while civilian production and infrastructure have been neglected and increasingly inefficient for decades. For the time being, the military and weapons industry is one of the main sectors in which Russia is investing, which means that the development of new technologies in this field will be a major challenge for the Kremlin.

Nowadays, Artificial Intelligence is increasingly being used to plan and assist military operations, as well as to gather intelligence and analyze the intelligence of the opponent (Szabadfoldi, 2021, p. 157). There is an increasing states' interest in developing autonomous

weapons systems and Russia is not an exception. "The country is expanding its Artificial Intelligence (AI) efforts due to the increasing attention that the nation's government is paying to the development of AI-assisted and AI-facilitated technologies" (Bendett, 2019, p. 168-177). It can be explained by the Kremlin's initiative to maintain its competitiveness among other international actors and preserve its strong political Image. However, the Russian Federation has never been a leader in the research on Artificial Intelligence. Moreover, "by being one of the biggest countries, it lacks a comprehensive national programme for AI development" (Kashin, 2019, p. 40), since the country started to pay its attention to this field not that long ago.

When it comes to the area of the AI, the main key competitive producers have always been the United States and China. "Beijing is pursuing a long-term and broad-based strategic effort to compete militarily and economically with Washington (Levesque, 2019; Bitzinger, 2021), whereas US policymakers aim to maximize the potential of AI for both economic and national security purposes (NSCAI, 2021), consistent with a long-held US focus on leveraging technology to ensure military superiority (Lake, 2019)" (Christie, Buts, & du Bois, 2021, p. 2). Therefore, considering the leading positions of China and the United States in robotics and vast technological growth, the Russian government began to allocate more financial, human and material resources for the active technological improvement and growth of the country. In doing so, the Kremlin is actively striving to become a part of the technological race and become the most influential producer (first-tier actor). However, the country is still facing economical limitations and a decline of military spendings that is not expected to rise any time soon. One of the ways to solve this problem was to actively attract foreign investors to fund development and studies of AI. Moreover, the Russian president Vladimir Putin is continuously stressing the necessity to narrow financing in areas, where the new technologies can be beneficially applied and used. During the annual addresses to the Federal Assembly in 2018 and 2019, he has publicly stated whoever becomes the leader in AI will 'become the ruler of the world' (Bendett, 2017, p. 168-177; Haner & Garcia, 2019, p. 334). As it was mentioned before, one of the dominant sectors of Russia's development is its military. And even if the indicators of the possibility of financing this industry remain rather low, which is can be due to the international sanctions that pushed the Kremlin to cut its defense budget (Kofman, 2017), it is still actively seeking to modernize the defense capabilities through continuous growth of research on AI and its further implementation. At the end of 2020, Vladimir Putin recommended "actively mastering" AI technology during the

training of military personnel. Defense Minister Sergei Shoigu also called for this as well as agreed that algorithms will determine the "future shape" of the Russian armed forces. In 2021, Russia's federal budget spending on national defense was planned at 3.11 trillion roubles (RBC, 2021) and in 2022 military expenditures in Russia will exceed 3.5 trillion rubles (Realnoe Vremya, 2021). The Ministry of Defense spent two thirds of this amount on arms procurement and modernisation.

The introduction of AI is actively traced in almost all spheres of activity of the Armed Forces of the Russian Federation (AF). It should be noted that certain elements of intelligent control systems are already actively used in the AF, for example, in its unmanned systems and robotics. Currently, "Russia is a leader in the lethal AWS race and strives to remain its most brazen supporter" (Haner & Garcia, 2019, p. 334). There is also active work in the application of other innovative technologies, such as war machines and robots, hypersound, directed energy, and social technology. Such active development and use of new technologies lead to noticeable changes in the strategies, planning and organization of the activities of the Russian Armed Forces. Moreover, the government is actively trying to stimulate interest in AI by organizing various summits and scientific conferences that are actively aimed at developing this area of research. For example, the Russian Association for Artificial Intelligence has repeatedly launched a variety of events to develop new unmanned technologies. Moreover, the Russian Ministry of Defense (*Minoboron*) actively promotes the holding of conferences on “AI technologies for the defense and security of the state", which are aimed at forming proposals for creating a mechanism for the accelerated integration of these artificial innovations from the "civilian sector" into the defense sphere. Last but not least, the Minoboron formulates proposals for creating a list of technological solutions to develop scientific and technological areas of research and the formation of relevant competencies based on its research organizations.

Under Putin's initiative, there were established several major areas of investment that are aimed to facilitate further technological growth of military capabilities. The Russian Foundation for Advanced Research Projects in the Defense Industry (FPI) was established in 2012 as an analogue of the US Defense Advanced Research Project Agency (DARPA) to develop AI-related industrial standards for the defense industry and the economy in general. "By being a key research agency, the FPI's portfolio includes efforts to develop intelligent systems to imitate human thought processes, analyze complex data, and assimilate new

knowledge" (Bendett, 2019, p. 168-177). By doing so, AI in Russia should develop along the lines of the following principles of efforts, such as image recognition, speech recognition, control of autonomous military systems and support for weapons life cycle (Ibid). "Following Russian programs for the *Creation of Prospective Military Robotics through 2025* and *Concept for Deployment of Robotic Systems for Military Use until 2030*, the Kremlin plans to have autonomous systems guarding their weapons silos by 2020 and aims to have thirty per cent of their combat power to be partially or fully autonomous by 2030" (Bendett, 2017; The Moscow Times, 2014). Last but not least, following the Presidential Decree “On the development of Artificial Intelligence in the Russian Federation", the government plans to develop standards that will regulate the safety of intelligent control systems for people and the environment through increased control by military forces (Office of the President of the Russian Federation, 2019). "These efforts included incentives for public-private cooperation, greater involvement of the nation’s private industry in AI development, as well as legislative and administrative support for the country’s technological pioneers and protection of citizens’ rights" (Bendett, 2019, p. 177). The draft of this strategy places great emphasis on AI education across all levels, and the development of AI hardware and software by the nation’s industries (Tadviser, 2020). "This great Kremlin’s innovations aim to remove humans from the decision-making loop which raises a lot of foreign concerns, especially, since Russia does not intend to comply with any international efforts to curtail or ban AWS use in combat" (Bendett, 2017; Tucker, 2017 in Haner & Garcia, 2019, p. 334).

5.2 Current trends in AI military production

Today, the Kremlin actively opposes the ban on lethal autonomous weapons and tends to develop this technology further. This initiative can be explained by the country's great desire to achieve its political and strategic ambitions both domestically and internationally. However, it should be noted that the amount and capabilities of Russian AI methods remain insufficient. The Kremlin tactics in developing new technologies are mainly based on simplicity, rather than complexity. It can be explained by a lack of financing possibilities as well as the fact that more enthusiastic/complicated solutions are more likely to be ineffectual. Parallel to the development of the Soviet missile program, the development and use of automated control systems for military activities began in the 1950s. During the 1960s and 1980s, there was a lot of attention paid to the development of automated control systems in

aviation, the navy, and the ground forces. However, because of a lack of these systems in the Soviet army as well as a lack of communications, intelligence, navigation, and high-precision weaponry, the Russian army did not use AWSs in its combat campaigns for two decades after the USSR's demise.

As it was previously outlined, Russia has been currently outspoken about its objectives in the development of Artificial Intelligence. The competition to dominate the creation of revolutionary technologies began around three years ago and is continuing at an increasing rate. In Russia, the national AI technology development program was officially launched in 2019 by Presidential Decree for the period up to 2030 (Tadviser, 2022). The main objectives of the national strategy for the development of AI technologies in the Russian Armed Forces can be identified as following: acceleration and deepening of military communication and command and control systems; modernization based on the wide implementation of AI of the military-industrial complex; implementation of AI in logistics systems; creation of technological and industrial clusters of AI mutually integrated with the military science of Russia (Ibid). Currently, the country's defense currently has more than "150 AI-enabled military systems in various stages of development" (Sharathkumar, 2022; Tadjdeh, 2021).

To date, the Kremlin has identified several priority areas for the integration and development of Artificial Intelligence in the Russian Armed Forces. Military autonomous systems, drones, and automated fire control systems (the last is not AI developed, but considered as one of the priority areas). There will be outlined the major military technologies that have been actively developed so far.

Unmanned ground systems & uncrewed ground vehicles (UGVs)

It is important to emphasize that any fighting environment is chaotic and, at times, unpredictable. Furthermore, in such a volatile climate, the enemy's military and technical capabilities are critical. That is why it is vital to train military people to accurately assess their position and evaluate their surroundings. The use of autonomous weapons, precisely UGVs, can indeed improve military capacity, namely through enhancing surveillance and reconnaissance procedures over large regions. They can be used to recognize items automatically during enemy and terrain engineering reconnaissance. They can also be used to find and clear explosive ordnance as well as to orient robotic devices that conduct tasks

autonomously. Thereby positively contributing to the expansion of combat space, as well as the survivability and reaction time of the aforementioned commanders.

Russian military production is currently focused on the development of the latest technologies, in particular the creation of intelligent systems of recognition that collect different sound and video information. For example, the multifunctional UGV *Uran*-14, which is designed for remote fire fighting in hazardous and hard-to-reach objects. It was used in 2020 to eliminate the consequences of a munitions explosion at an arsenal in the Ryazan region (Kretzul & Cherepanova, 2021). The *Scarab* and *Sphere* complexes are also actively being used. The complexes are intended for operative collection of audio-video information in hard-to-reach and dangerous for people zones with the following transfer to the remote control by radio channel. With their help it is convenient to make engineering reconnaissance of remote places. For example from wells, cellars and tunnels. The complexes are equipped with video recording devices, and the picture from the robots is broadcast directly to the operator. Also, both systems were also actively used in Syria (Batya, 2020). Finally, "the Advanced Research Foundation and NP Android Technology collaborated to create the *Marker* unmanned ground vehicle to aid Russian soldiers in the battlefield. The system can perform a given task autonomously and tackle any possible dangers on the battlefield" (Sharathkumar, 2022).

Reconnaissance and inspection complexes *Scarab* (bottom) and *Sphere* (top)

Source: Interpoltex 2015

Uran- 14
Source: Army Technology 2022

Uran-9
Source: Military Leak 2021

Kungas
Source: OVD 2019

Also, the Kremlin is actively promoting the *Uran-9* and *Kungas* unmanned ground systems, "which were actively used in Syria and in a large-scale exercise in the East in 2018" (Wodecki, 2022). Both robots are capable of detecting enemies using opto-electronic systems and radar and destroying them with on-board weapons fire or transmitting information to other units. The operator can remotely control the robots from several hundred meters behind, including when they are in cover. The operator can monitor the situation using a number of cameras. And even if the *Uran-9* uses weapons at the operator's discretion, the robot also has the potential to be completely autonomous (has pre-scripted commands). It's worth mentioning that this reconnaissance and fire support robot along with the *Nerekhta* system were first used during the joint Russian-Belarusian strategic exercise Zapad-2021 (Vedomosti, 2021). Besides, "the Kremlin is also developing naval and underwater autonomous vehicles. It is reported that in 2021 the Russian Ministry of Defense has armed naval vessels with *kamikaze* to strike at ground targets, enemy ships and assist special forces soldiers on secret missions" (Wodecki, 2022). Nevertheless, to attain competitive military advantages, military ministries throughout the globe are increasingly spending extensively in military autonomous systems. In this backdrop, the Russian Armed Forces have a compelling motivation to increase AI research in the pursuit of military parity. However, despite its immense technical potential, Russian technology, like all other technologies, has some downsides.

Unmanned air systems (drones)

"Russia is intent on spending almost as much as China on drones by 2021, has a military robotics-focused rearmament budget of $346 billion, and hosts annual conferences on the roboticization of its armed forces" (Bendett, 2017, p. 168-177). It should be noted that the necessity for strike drones came with the start of the Russian Aerospace Forces (*Vozdushno-Kosmicheskie Sily or VKS*) military intervention in Syria. The Russian *Orion* flew for the first time in 2016 (Hindustan News Hub, 2021), becoming the domestic counterpart of the American *MQ-1C Gray Eagle*. It should be noted that while information regarding the export version of this drone is available, the version utilized by the Russian Air Force is confidential and not disclosed. This drone is capable of conducting reconnaissance, providing targeting, striking ground targets, fighting enemy air assets, and patrolling. As noted by experts, the drone is made with elements of Artificial Intelligence, thus, it is

possible to set common tasks for it to solve independently (Kretzul & Cherepanova, 2021). Moreover, the *Hunter* can play the role of a successful forward echelon of operational and tactical aviation units and formations (Ibid).

Orion
Source: The Defence Post 2021

Hunter
Source: Laszlo 2022

Altius
Source: Army Recognition 2019

Last but not least, among the heavy drones now in Russian service is the *Altius*, which is equipped with satellite communications and elements of Artificial Intelligence capable of interacting with manned aircraft. "The drone can operate independently and communicate with Russia's fifth-generation fighter, the *Su-57*. When given target coordinates, *Altius* constructs an algorithm that discovers the best path to the target and calculates acceptable places for dropping bombs, all without the intervention of an operator, and then returns to base, planning the safest route" (Sharathkumar, 2022). Last but not least, "*the Kalashnikov Group*, which manufactures Russia's famed assault guns, created the *KUB-BLA* drone. It is intended to kill distant ground targets by delivering a payload of target coordinates specified manually or on an image from the drone's guiding system" (Wodecki, 2022).

Russia presently exports the *Orion-E* (Medium Altitude Long Endurance - a class of medium-altitude drones with a long flight time) and the *Orlan-10E* (CNEWS, 2021) medium-range reconnaissance drones. The *Orion* (made by *Kronshtadt Group*) is one of the Russian UAVs for export. It is ideal for a wide range of military and civilian purposes. According to the same source, this drone's uses vary from surveillance and intelligence assistance for the army to firefighting and goods delivery to difficult-to-reach places (Ibid). *The Kronshtadt* is also actively developing its more sophisticated

Frigate
Source: Defence Blog 2015

Fregate glider for freight transport in locations with limited transportation infrastructure as well as for search and rescue operations. In this way, such AI systems make it easier for commanders to collect, systematize information, make effective decisions and maintain tactical mobility.

Automated fire control systems

Currently, the Russian Armed Forces are currently actively developing and integrating Msta-SM 2S19M2 systems. This new generation of self-propelled robotic artillery systems has an extended range and uses intelligent high-precision projectiles (Sharathkumar, 2022). This system is designed to destroy and suppress artillery and mortar batteries, tanks, anti-tank, and electronic weapons, armored vehicles, command posts, air and missile defenses, destroy field defenses, and prevent infantry and tank reserve maneuvers (Vershinin, 2020). An important advantage of the self-propelled gun is the ability to select targets and aim the gun both through a special automated system from the battery commander's control room and directly in the combat compartment of the fighting vehicle. As for the deployment of Msta-SM 2S19M2, it was highly used in 2014 in the military conflict in Ukraine (Ferguson & Jenzen-Jones, 2014, p. 71). Moreover, in 2013 "the 2S33 Msta-SM2 is an improved variant of the 2S19 Msta-S that was revealed in 2013. It can fire ammunition with more propellant charges and with a higher breech pressure than the previous model" (Army Recognition, 2022). This howitzer is currently extensively used in the ongoing conflict in Ukraine (see Oryx, 2022).

Msta-SM

Source: Gavrilov 2020

Nevertheless, it is quite challenging for Russia to currently take a leading position in AI development. It can be said that even though the Kremlin is assertive in developing innovative technologies, there are still various structural challenges that the country needs to address first. Therefore, the following section will shed light on the economic and strategic-political implications that Russia is currently facing and that are limiting its possibility to become the first-tier product of AWS.

5.3 Russia's structural limitations: challenges in economic potential & political acceptance

Russia, which straddles the European and Asian continents, is one of the world's largest countries, with an impact that extends far beyond the former socialist states that comprised the USSR. The constant pace of technical growth was maintained until 2014, when geopolitical and economic events resulted in crisis phenomena that adversely impacted Russia's political, economic, and even its very status as an active player in the international arena. The country's economy is currently in a state of active and serious crisis. Even if any positive tendencies in the Russian economy might be observed between now and 2022 (e.g, an increase in business and consumer interest in accepting loans as well as in the use of innovation and new goods), they are currently non-existent. Furthermore, as a result of the Kremlin's desire to deepen the war with Ukraine, Russia has placed itself in utter isolation and self-deprivation of the benefits of international collaboration.

When it comes to interest in proactive innovation, it usually indicates a positive rate and abilities of economic development in the country. Russia cannot afford to create the capacity to retain its technical growth and potential at this time. This issue is also closely related to the country's economic decline, which has been compounded by the country's increasing war with Ukraine since February 2022. Moreover, "the political nature of the sources of the crisis makes it significantly more difficult to overcome its consequences, because the government has no desire to overhaul the present model of state governance. Their priorities primarily include maintaining control over political and social life and regaining Russia’s superpower status on the international arena" (OSW STUDIES, 2017, p. 5). However, when it comes to addressing the economic potential, it is not in the best interest of Russian policymakers. It is important to acknowledge that when a country's economy is unstable, the potential to innovate cannot be created or realized. The top producers may not consider economic primacy to be the main reason for their active productive potential. However, they do realize that a stable economic potential is necessary for successful production and possibility to invest in technological development of any sphere. In the case of Russia, however, it is the strengthening of its political status (*pursuit of power*) and the maintenance of its international image (*pursuit of victory*) that is the main priority. The Kremlin actively advocates leadership in the arms race and AI production in the military sphere. But despite this, such indifference

to the country's low level of economic capacity can lead to "long-lasting stagnation and a worsening backwardness when compared with developed countries" (Ibid, p. 6). Therefore, this section seeks to address the primary reasons why Russia is currently unable to become a leader in innovation capabilities particularly in the creation of modern weaponry with Artificial Intelligence elements. Moreover, it is important to identify why the country that actively develops a specific sector of military production still cannot be named a first-tier producer. In doing so, there will be an analysis of the strategic-political limitations, the effect of sanctions in 2014 and 2022 as well as the economic problems that Russia is facing in the weaponry race.

Strategic -political limitations

"In the decades since the collapse of the Soviet Union in 1991 and the repercussions it has had on Russia's position in the world, Russia's leaders have been intensely focused on repairing the damage and regaining a position of influence in the world that it considers worthy of a great people and a great nation (*pursuit of power*)" (Berls, 2021). However, such goals have always been actively accompanied by large methods of control by the state apparatus, as well as fiercely defended national interests that have actively mistrusted democratic states.

To begin with, it should be noted that no major contemporary state accepts the notion of a multipolar world order as wholeheartedly as Russia. None of the great nations go so far in their verbal attempts to reshape the world's unipolar structure. "In the decade following the collapse of the Soviet Union, Russia battled to establish its identity and ties with the West" (Berls, 2021). Russia gradually asserted its intention to supplant the US-dominated world system. Multipolarity has gradually shaped the conceptual underpinnings of Russian thought about international relations, influencing the form and substance of Russian foreign policy.

In some ways, Moscow sees multipolarity as a successful deterrent to the establishment of a tight US-China bipolarity, which might confront Russia and severely constrain its political position (Turner, 2009). This drive to strengthen the country's leadership status was even more bolstered by Putin's initial ascension to the presidency in 1999, following the departure of the previous leader, Boris Yeltsin. The new leader spoke extensively about the necessity of political multipolarity during a conference in Munich in 2007. The unipolar paradigm, as

Putin tends to claim, is not only unsuitable for the current world, but also impossible (Putin, 2007 at MSC, 2007). Not only would the modern world be devoid of military, political, and economic resources under unipolar rule but, more crucially, the paradigm is untenable in its current form (Ibid). He pushed the idea that new centers of global power were needed to solve global problems. In doing so, Putin vocally acknowledged that he was ready to compete with the US for the position of global leader (*the pursuit of victory*).

As for Russia's foreign policy (FP) concept, the fundamental strategic document speaks of the primacy of national interests, which determine and structure the country's priorities in the international arena (The Kremlin, 2008). It is worth noting that Putin's FP postulates were not fundamentally different from those of the Yeltsin period. "Under President Yeltsin, Russia was defining, together with the West, new 'rules of the game' that would determine how the two worlds would interact in the coming years and decades" (Berls, 2021). However, since 2007, Russia's political image has taken on a certain reinterpretation, instilling an unprecedented consistency in the international positioning of the country as an important actor on the international stage and a more assertive approach in defining its strategic interests. In doing so, Putin has developed a tendency to place national interests at the center of the country's strategic goals. Thus, "Russia has increasingly begun to take many actions, using its vertically aligned instruments of national power to enhance its position in the world.

One of the country's most profound actions was the annexation of Crimea and the occupation of southeastern Ukraine by Russia-backed separatist forces in 2014. Such acts, however, did not reflect well on Russia's political standing in the international arena."It was in many ways the low point for Putin’s deepening estrangement from the West. During the G20 summit in Brisbane (2014) the Russian leader was broadly ostracized by the most powerful figures at the table, and some of them were less diplomatic toward Putin than before" (Shuster, 2014). Moreover, "the Russian president has spoken explicitly about the worsening climate between Washington and Moscow, insisting that what the Obama administration wants is *diktat* rather than dialogue" (Marcus, 2016). However, it might be claimed that, following this year, the Kremlin has been primarily confronted with economic sanctions rather than political ones.

Indeed, the Western response to the Russia-Ukraine crisis has only spurred Moscow to become more politically alert and forceful in defining its national interests and FP goals. But it is important to outline that the idea of "possessing an extra mass of land, which in itself is important and somehow mysteriously rewards its owner with world - or at least regional -

domination, is deeply outdated" (Trudolyubov, 2022). Such an idea only increases the political vacuum in which a country may inevitably find itself in. Moreover, for many observers, the conflict signaled a significant transition in "the global security environment" from an era of unipolar dominance by the United States to one characterized by renewed rivalry among major powers (Masters, 2022). However, it should be understood that such an international policy of Putin cannot be called a strategy, but rather an unpromising and ill-considered tactic.

The rivalry with the West is a distinguishing characteristic of Russian President Vladimir Putin's FP. In 2015, Russia's National Security Strategy included proposals for preventing Western influence on the country's military, foreign policy, economic, and cultural achievements (The Kremlin, 2015). As a result, it was determined to deal with the strain in two ways. To begin, increasing domestic control to oppose foreign meddling in the country's internal affairs. Finally, any attempts to instill oppositional inclinations must be thwarted (to deprive the country of the possibility of creating the so-called color revolutions) (Ibid). However, such total control at the domestic level can be detrimental to the opportunities for political innovation. Moreover, it can also create a negative environment for citizens (political and economic stagnation leads to increasing resentment among the population) and in interactions with other political actors (increasing mistrust and problems in relations).

From 2021 onwards, the Kremlin's policy became more stringent, and the new security strategy began to include references to combating not only extremists who undermine the country's constitutional order, but also those who promote Western influence in the country, including cultural and ethical influence (The Kremlin, 2021). It also singled out an endeavor to allow the country to grow independently and actively participate in the arms race. The architects of the new plan tend to believe that Russia should establish a new self-sufficient high-tech economy with a minimal contribution of hydrocarbons in energy production. That is, progressively abandoning fuel extraction as the foundation of the economy and keeping up with the West in terms of technical growth without relying on outside assistance (Ibid). As with the previous set of strategic insights, the goal of reducing reliance on imports, notably high-tech imports, was vigorously pursued. Finally, the interpretation of economic progress was not the primary goal, but rather a long-term strategy. The Kremlin has aggressively backed the concept of increasing the proportion of investment in the economy. However, under the current circumstances Moscow is incapable of addressing its defined goals, since its

main concern is to withstand its political and economic decline. "The correlation of forces for Russia is expected to become considerably more unstable over the next three to five years" (Rumer & Sokolsky, 2022). And at this stage, the country will not be ready to respond to actively emerging challenges.

Nevertheless, "while Russia has now demonstrated that it lacks the military strength to challenge US supremacy in Europe, let alone on a global scale, no one, particularly the NATO alliance, has ignored its nuclear capabilities, as evidenced by the alliance's refusal to intervene directly in the Ukrainian conflict. Moscow is also utilizing arms sales and military action to strengthen relations with nations in Asia, Africa, Latin America, and, most notably, the Middle East" (WPR, 2022). Furthermore, the Kremlin has actively increased its interest in strengthening bilateral relations with non Western actors such as Beijing and New Delhi on strategic and economic issues. Currently, Russia puts a self-portrait vision of its "de-dollarization efforts as a to skirt sanctions by jointly building an alternative global financial system with China and India. Although New Delhi has been a skeptic of such a de-dollarization alliance, it has devised means to deal with Russia while avoiding sanctions (India has been pursuing a rupee-ruble trade agreement with Moscow)" (Council on Foreign Relations, 2022). Moreover, the Kremlin also intends to play a key role in triangular cooperation and regional organization strengthening, including the Shanghai Cooperation Organization. This tendency in maintaining win-win cooperation with non Western countries has even strengthened with the beginning of Russian-Ukrainian conflict. "Whereas Europe and the United States are swiftly moving to cut long-standing ties, the governments of China, India and South Africa are maintaining links" (Nature, 2022). However, the same search for alternatives in cooperation is also pursued by Western countries. For example, Germany is now actively considering the possibility of supplying liquefied natural gas from Qatar and the United Arab Emirates, thereby reducing the country's dependence on Russian gas (Aljazeera, 2022). These active rise of strategic cooperation steps may also have an impact on the political relations between the countries, thereby developing closer ties. Other European countries are in the same vein, seeking new forms of cooperation to reduce relations with Russia, given its current political position on the international arena. Such political upheavals have a negative impact on Russia's ability to actively participate in international affairs and promote its foreign policy ideas.

Thus, the Kremlin's political power and influence is in a kind of vacuum without the possibility to develop on the external level, but only aggravated and tightened on the internal level. Under such conditions, it is impossible to speak of any innovative progress. Moreover, it is important to outline that due to the Kremlin's current political position and aggressive nature of its FP, other international actors will try to secure their position. Precisely, "in the absence of conventional military forces in Europe and treaties to eradicate intermediate-range missiles, NATO nations will be able to deploy weapons that Russia (and the Soviet Union) have long regarded as dangerous due to their capacity to put important targets in Russia's heart at risk" (Rumer & Sokolsky, 2022). At the same time, Beijing's ambitious buildup of its strategic nuclear weapons may motivate Washington to update and become more assertive in its "strategic force modernization program" (Ibid). Thus, the Kremlin will end up in the position where it will have to face the new arms race tendencies but with inability to compete in it due to economic and political limitations. Putin is attempting to recreate 20th Century geopolitics in 21st Century modernity, where economics, money, and technology trump geography and land mass (Trudolyubov, 2022). Following this method, however, will result in failure to govern a civilian economy, financial system, and inability to build the state's own technical and inventive capabilities.

Addressing Sanctions

The above-mentioned constraints, of course, have a significant influence on Russia's technological and inventive capacity, but the gravity of the current political context must also be acknowledged. To begin with, since 2014, the Ukrainian conflict has revived diplomatic tensions between Western Europe and Russia. The Russian crisis at the time was characterized by a combination of two fundamental factors: the sharp decline in energy prices "(for example, Brent crude fell from $110 to $50 per barrel between June 2014 and January 2015) and the exacerbation of the foreign policy situation due to the events in Ukraine, which led to the imposition of economic sanctions" (BBC, 2015). "Both European Union member states and the United States imposed a wide range of economic sanctions against Russia as a consequence of the illegal annexation of Crimea and for undermining Ukraine's territorial integrity. They have been joined in these actions by, for example, Canada, Norway and Australia" (Korhonen, 2019, p. 19; Korhonen, 2021). "Western countries introduced a series of so-called sectoral sanctions, which included a suspension of preferential loans to Russia for economic development; a ban on bond and stock trading and related brokerage services; a

ban on loans to Russia's five largest state-owned banks: Sberbank, VTB, Gazprom Bank, Vnesheconombank and Rosselkhozbank; an embargo on arms trade between EU members and Russia; a ban on the export of so-called dual-use goods" (US Department of the Treasury, 2014).

However, it is worth mentioning that while Western financial sanctions have affected the Russian economy, they have by no means been the sole driving force behind the crisis. The economic slowdown had already begun about a year before the sanctions were imposed and continued in 2014, when annual GDP growth was 0.7% (down from 3.7% in 2012 and 1.8% in 2013) (RBC, 2019). The slowdown in the economy in that period was mainly due to structural problems such as negative demographic trends, over-regulation within the country and also a poor business environment. In today's Russia, the main features of the current demographic situation are also facing the crisis status, which is characterized by significant population decline, low birth rates, and the continued aging of the population. There is also a high mortality rate and low birth rate. For example, "in 2020 the death rate among Russians over the age of 64 was about 260,000 persons higher (20 %) than the average of 2017-2019" (BOFIT, 2022). Furthermore, it is worth recognising that, given the crisis situation in the economy, the negative demographic trends cannot be addressed by active political interventions. Even if the Kremlin has the power to influence the health care system, the economy itself cannot regulate or develop it. Moreover, thanks to Moscow's current political stance, which has led to renewed conflict in Ukraine, the country's healthcare system has been drastically degrading. "Russia is running low on insulin and other important medical supplies produced abroad. It reported that deliveries from Europe have all but stopped and those from China and India - which account for up to 80% of imports - have been hampered by supply chain disruptions" (The Moscow Times, 2022).

Regarding the issue of over-regulation in the country, there are certain problems related to state monopoly. "The deficit of the state budget of Russia in 2017 amounted to about 3 trillion rubles (equivalent to 44.8 USD bn in 2016)" (Kirsanov, Safonov & Ramirez, 2016, p. 143). However, the Kremlin has not sought any gradual decentralization of regulation or increased positive specificity in different sectors, for example the gas industry. In fact, "shortly after Putin entered power, the state began to monopolize the distribution of energy output in Russia. Putin took over *Yukos*, the country's largest oil business at the time, between 2003-2004" (Hess, 2022). Then, under the initiative of the Kremlin, the most valuable *Yukos*

assets were transferred to the state oil company *Rosneft*, led by pro-Putin chairman Igor Sechin. Later, *Rosneft* and *Gazprom* became the main oil companies. As for the management of *Gazprom*, it has continued to pay out huge dividends over the years. This tendency in the context of the economic crisis in Russia has only increased social tensions. "Global experience shows that the gradual decentralization of regulation and the emergence of new energy suppliers leads to the emergence of a civilized market, improved business efficiency and, consequently, higher budget revenues" (Ibid). Moreover, since 2014 "Russia has actively sought to balance its budget through a sharp devaluation of the rouble, which has pushed up the costs of restructuring the population. About half of Russia's government revenue is financed by taxes on oil and gas, which are priced in dollars on international markets" (Foreign Policy Research Institute, 2018). Vladimir Putin has actively exploited this centralized mechanism and created the conditions for a devaluation of the currency. However, even if these actions have to a certain extent stabilized the country's budget, they have also actively stimulated even greater economic degradation.

At the same time, Putin has for many years initiated precisely the intensive efforts to highly centralized state structures and all spheres with economic and technological potential. "In 2020, Russia saw an extreme political upheaval with the constitutional reforms that marked a critical turn in Russian politics, towards a much more authoritarian and repressive regime, with no tolerance for opposition" (Stanovaya, 2021). Thus, the country's economic market was limited in its possibility to grow and develop independently of the state apparatus. Moreover, "public finances have also been seriously affected: the worst problem for the government is the need to find sources to plug the budget gap, with dwindling revenues from the export of raw materials and reserves, and limited access to foreign loans" (OSW STUDIES, 2017, p. 5). Nonetheless, despite such dismal indications of opportunity, "small and medium-sized businesses remained an important element of the Russian economy. Furthermore, not only was a new kleptocratic elite steadily emerging in the country, but global corporations began to penetrate the Russian market " (Hess, 2022).

In 2022 the situation changed, "the country is actively heading for the deepest recession since Soviet collapse; and the Kremlin is pushing the state toward becoming a closed economy" (The Guardian, 2022; Egan, 2022). "The business departures are already blowing holes in the Russian economy and are expected to leave thousands of workers unemployed" (Beardsworth, 2022). According to Yale's research, "over 750 companies have curtailed

operations in Russia and 250 from; them have already severed ties with Russia" (Yale, 2022) thus drastically increasing unemployment rates across different sectors. It is important to mention that the early 1990s transformation crisis occurred against a backdrop of severe macroeconomic shocks, which were principally characterized by a comprehensive collapse of economic relations. A similar scenario is unfolding currently in 2022, but a crucial difference is the broad disruption of technology and manufacturing systems. "Western powers have frozen about half of Russia's foreign reserves, banned certain Russian banks from the high security SWIFT banking network and blocked exports of key technology to Russia; the United States has also prohibited the import of Russian oil, natural gas and petroleum products" (Egan, 2022). At the same time, the Russian government has consistently relied on the selling of raw materials to fund the purchase of consumer products and advanced manufacturing equipment. Following these Western consensus responses, Russia has ended up in the situation where it is isolated and has limited power in conducting its technological and innovative goals.

Nevertheless, it is critical to thoroughly examine the essential aspects about Russia's economic constraints, which may be regarded as one of the major impediments to the country's technical and innovative growth potential. According to the European Parliamentary Research Service, "Russia has changed beyond recognition over the past 30 years, but in many ways the economic challenges faced by the country still resemble those of the Soviet era along with current ongoing political changes. Abundant natural resources support an adequate standard of living for the population; however, the economy, which is dominated by large and inefficient state-owned enterprises, lacks competitiveness and innovation and other challenges" (EPRS, 2018, p. 2). However, this thesis seeks to address Russian economic limitation by outlining its limited funding, and generally weak economy that is currently struggling with the ongoing sanctions.

Limited Funding

"The Soviet Union invested heavily in research and development – in 1990, around 5% of GDP– and achieved outstanding results in fields such as space exploration and theoretical physics (seven Nobel Prizes). Research spending has declined since then to 1.1 % of GDP in 2015 – well below the EU-28 average of 2 %, but at a similar level to many other countries with a comparable level of economic development" (EPRS, 2018, p. 12). In Russia before the

escalation of Ukrainian conflict in the beginning of 2022 the financing of innovative projects and innovations was considered as one of the most promising types of capital investment in the field of development including the sphere of Artificial Intelligence. Nonetheless, there is now a dearth of financing in the Russian Federation's innovative potential. Before the newly imposed sanctions, the country's inventive activity did not surpass 9-10 % (Maltsev & Azarov, 2014). This low index was mostly due to the enterprise's lack of internal resources, as well as the inaccessibility of external sources of finance for creative activities.

Moreover, the poor ability to finance can be explained by Russia's stable negative investment climate, which does not match the prerequisites of vigorous economic development. For example, the government is deliberately reducing its funding for numerous scientific investigations. If the state takes such a choice, there must usually be another source of financing to encourage the development of inventive potential. Innovative initiatives will be successful if all parties, including the government and the business sector, work together to support them. Thus, effective inventive activity should incorporate a developed financial system that contains complex interweaving of forms and sources that change by type of ownership, degree of centralization, levels of ownership, and types of financing. In the case of Russia, there is significant scarcity of scientific professionals and highly skilled employees, both of which are required for the growth of the state's innovation economy.

However, starting from the end of February 2022, lots of international companies and personnel started to leave the Russian market. Thus, "in light of unprecedented international sanctions, including on the Central Bank's reserves, the Russian authorities have imposed draconian capital and foreign exchange controls to prevent the collapse of the financial system and bolster the ruble" (FOCUSECONOMICS, 2022). Under such circumstances, the state machinery is clearly incapable of maintaining consistent finance in innovation, and any private investment remains restricted and extremely volatile as a result of a number ongoing sanctions and restrictions. Furthermore, the index of expenditures on R&D undertaken by the Russian entrepreneurial sector of science using company money is rather low. In Russia, this statistic is only 21%, whereas in the United States, it remains constant at 66% (The Kremlin, 2014). In 2022 this index is expected to be even lower.

Weak economy

As previously stated, the Russian economy entered a lengthy period of decline following the demise of the Soviet Union. According to Business Insider, "the Russian economy has decreased by an average of 7% each year for the past seven years" (Roberstson, 2022). However, despite low economic growth, there have been positive indicators of overall development. Now, however, "Putin's brutal war in Ukraine should wipe out 15 years of growth and return the Russian economy to the dark days after the collapse of the Soviet Union" (Ibid). Hundreds of foreign enterprises have fled the nation during this period, the European Parliament has called for an embargo on Russian energy supplies, and Russia is projected to fail in the near future. "According to the World Bank, Russia was the 11th largest economy in the world in 2020. But by the end of this year it may rank no higher than 15th, based on the ruble's exchange rate at the end of February, according to Jim O'Neill, a former Goldman Sachs economist" (Reuters, 2022). Furthermore, it should be noted that with the imposition of sanctions, Russia has found itself completely isolated from the global financial system. In this new reality, the Russian Central Bank is in a situation in which the West has entirely frozen its worldwide monetary assets. "The Institute of International Finance expects a 15% drop in economic gains in 2022, followed by a 3% drop in 2023" (Ibid).

Initially, Russia's economy may be described as having a relatively basic export structure and an insufficiently quick expansion of new industries and technologically complex service sectors. Since 2022, the economy has deviated from this balance and has become the polar opposite. However, it should be noted that the eventual form of this still-new economy is unknown. Some sectoral changes may occur, but the degree of these changes is yet to be discovered. Russia's poor degree of economic security also had a detrimental influence on its inventive activities. One of the most serious concerns is an overreliance on foreign investments, which can lead to greater technological, raw material, and financial reliance on foreign investor countries. Russia has become isolated as a result of the introduction of sanctions, so any development is likely to be restricted.

It is particularly important to note that one of the main objectives of Western sanctions at the moment, apart from economic restrictions, is also a ban on exports of dual-use technologies (which can be used to develop the military-industrial complex). To date, the Russian economy has depended directly on the sale of its military technologies to countries with low

technological potential. For example, "in the last two decades, Moscow has managed to deepen its connection with Africa and has become the biggest arms supplier on the continent. Moreover, “Russia's state arms seller Rosoboronexport announced in April 2020 the first contract to supply assault boats to a country in sub-Saharan Africa” (DW, 2020). In case of Algeria, for example, "it has purchased a wide swathe of Russian heavy military hardware, including over 500 T-90SA main battle tanks (MBT's) and 300 modernized BMPT-72 Terminator 2 infantry fighting vehicles" (Episkopos, 2021; Joy, 2021). However, as sanctions and airspace bans continue to tighten, the route for arms delivery to Africa has gotten increasingly problematic. Imports of technology and components have also been targeted. In February 2022, "Washington announced sweeping restrictions on technological exports to Russia which halted direct technological exports from the United States to Russia, in an effort to curtail Russian industries including defense, aerospace and shipping" (Swanson, 2022). It is critical to recognize that high performance computer technologies are now playing an increasingly crucial role in ensuring effective combat. They provide combat simulations as well as intelligent decision assistance (including the use of Artificial Intelligence technologies). Furthermore, the availability of sufficiently powerful (electronic processing equipment with adequate software content) is becoming an increasingly crucial component in anticipating the employment of various forces and methods in a military confrontation. Such technology is required for Russia to become a leader in innovative capability, particularly in the development of Artificial Intelligence in the military field. Therefore, by cutting out the access to technological import the Kremlin is actively struggling with the inability to be a part of the innovational race. Of course, some Russian industry will be able to maintain its technical level, because means of importing vital technology or raw materials through so-called friendly nations such as the former Soviet Union, Turkey, India, and, to a lesser extent, China are being actively pursued. However, such paths for the import are highly time consuming, thus, need further improvement to be more efficient.

The worldwide surge in commodity prices may be the sole lifeline to Russia's current economic condition, at least in the short term being. Furthermore, "Russia is the world's third-largest oil producer and a third one of Europe's natural gas" (Robertson, 2022; Downs, 2022). However, the EU along with the US are gradually attempting to cut their purchases of gas and oil. In the long run, Russia will face a prohibition on imports and technologies. All of these reasons point to an impending and lengthy economic slump, reducing the country's technical and inventive potential for many years to come. It is also important to note that

"Russia has utilized its military to broaden its worldwide influence and strengthen geopolitical relationships. Its vast military modernization program has also put the US and its NATO partners on high alert" (WPR, 2022; O'Connor, 2022). However, since the outbreak of the military conflict, Russian forces have shown a poor record of achieving the Kremlin's military objectives. Moreover, Russian military equipment has proven to be more innovative than that imported into Ukraine. And of course, any country with a developed military potential always has a need for constant technological development. However, as has been repeatedly mentioned in this paper, any innovative capability has to be accompanied by a high economic capability. In the case of today's Russia, this initiative of some kind of active technological development (in particular the introduction of AI in the military sphere) is impossible due to economic constraints (both internal and external).

Conclusion

This thesis seeks to answer several major questions based on extensive analytical and theoretical study and data offered throughout this work: (1) can a country with numerous structural limitations (e.g., sanctions, economic, political and strategic problems) compete with the dominant weapons producers by focusing on developing only one specific sector of armament? (2) can Russia be able to maintain its technological potential along with being a part of the arms race under its current highly challenged and limited international status?

The theoretical part of this study was based on Keith Krause's (1992) theory of the hierarchy of arms manufacturers. According to him, there are three types of producers whose positions in the production system are unevenly distributed. Moreover, the author identifies these three main types of manufacturers that can be placed in a hierarchical order based on their armament production capabilities. Those countries that are not competitive in arms production are deprived of the title of great power and occupy the lower positions of the system. Both three main types of manufacturers also have a certain number of motivations that shape their desire to produce weapons. This can be either the desire to support their economy by selling and producing weapons (*pursuit of wealth*); to increase their political position and ensure the balance of power in the region by producing weapons that are in demand (*pursuit of power*); or to develop their independent innovative potential and act as a leader in production by relying on modern technologies (*pursuit of victory*). This paper has determined that during the Soviet period, the country aimed to be the dominant player in the field of arms production, thereby it successfully pursued its power and dominance on the market.

However, with the collapse of the Union, Russia faced many problems within the country, particularly economic and institutional weakness and instability. The country lost its former dominance in the arms production system and ended up in the position where it had to pursue the desire to be more economically oriented in arms production rather than being motivated to focus on innovations and technological growth. Moreover, the country was unable to restore or accelerate the production of existing military systems, as the USSR used to be able to do. Since the institutional system was not fully developed and there was no clear

understanding of the goals and directions that Russia had to create, many companies in the military sector were forced or actively sought to change their priorities (Kazantsev, 2014). Thus, the military industry lost its former importance and lost centralized funding and support due to the reshaping of management institutions. Consequently, Russia was forced to support its defense industrial complex not with new technological capabilities and innovations, but with exports to countries with low military potential to boost its unstable economy. However, Moscow still sought to maintain its political importance and maintained military ties with post-Communist countries as well as with Third World countries. Thus, post-Soviet Russia was motivated by the *pursuit* of its *power* and *wealth*.

As the analysis follows, it was determined that with the inauguration of the President Vladimir Putin (in 1999) the country's domestic and FP goals were changed. "Russia, which tended to capitalize on its energy competitiveness to enter into Western economic markets, no longer considered the conventional means of ensuring stability and security to be appropriate. Its security stance remained mostly defensive, but it now began to consider that a more proactive policy will best protect national interests" (Tsygankov, 2008, p. 38). When it comes to the *pursuit of power* the country is actively trying to regain its influence and great nation status. As for the *pursuit of wealth*, the Kremlin still actively intends to develop its military export potential. However, Moscow also finds itself interested in regaining its military leadership. In doing so, Putin identified the implementation of Artificial Intelligence in armament as a primary tool to restore the country's dominance in the field. As Krause tended to believe, it is the high indicator of technological progress and innovation that permits the country to become a leader in the hierarchical system of arms producers. At this stage, the dominant leaders in the production of such systems are the United States and China. However, the high demand for autonomous weapons has prompted many countries to join the modern arms race (e.g, South Korea, Izrael, Turkey and others), and Russia is no exception. Only the most successful manufacturers are able to broaden their knowledge, establish new manufacturing facilities, and become so-called first-tier weapons manufacturers. Thus, the Kremlin is actively pursuing the development of the military AI sector, expecting that the creation of such breakthrough technology would allow it to effectively become the race leader.

However, as the analytical study of this research shows, self-determination of goals and their active voicing is not a successful way to achieve them. This means that even if Russia seeks

to *pursue the victory,* there are necessary components that guarantee success in achieving this goal. From a theoretical point of view, leaders in weapons production should not only be able to innovate and expand technical capabilities, but also produce absolutely all weapons systems for all types of military applications. In the case of Russia, the country tends to expand its military production while concentrating on a certain industry, and this rather limits its competitiveness on the international military market (Section 5.1). Moreover, the dominant producers have the ability to limit or control political exports due to consumer demand for their highly applicable R&D and innovation capabilities in manufactured weapons (Section 2.2). Today, Russia faces significant deficit in electronics and information technology, as well as an unacceptably low defense industry and R&D funding, thus, making it exceptionally difficult to reach the current dominant armannent producers' capabilities (Section 3.3; Section 5.3).

Moreover as the research indicated there are several structural limitations that Russia is facing such as strategic-political, sanctions and economic problems. Since 2014, the Kremlin's policies have attracted much criticism from the international community, especially from Russia, as both external and internal policy guidelines are broadly aimed at achieving its own goals. The escalating conflict with Ukraine in 2014 caused widespread protest from the Western community in the form of sanctions. However, it is worth understanding that the imposition of restrictions is not only economic in nature. The sanctions also play a significant political role, because the country can be in a certain political bubble, without the ability to participate much in the international arena. In the case of Russia, it has lost its status as a reliable player, thereby lowering its political status. Such indicators have a negative impact on the country's overall ability to develop. At the moment, the country's weak ability to finance is also due to Russia's consistently negative investment climate, which does not meet the prerequisites for active economic development (Section 5.3). However, it is important to mention that this trend was already evident before any sanctions were imposed. The economic potential of post-Soviet Russia has been decreasing year by year and this was caused by various internal problems in the country, such as negative demographic trends, over-regulation within the country, and a bad business climate.

From 2022 onwards, the Russian innovation potential will get even worse due to the introduction of new sanctions, which have put tremendous pressure on both Kremlin policy and the country's economic capabilities. "Moscow is deliberately going for the biggest

recession since the collapse of the Soviet Union, and the Kremlin is pushing the state to become a closed economy" (The Guardian, 2022; Egan, 2022). Moreover, the country at this stage is unable to maintain its technological capacity and development because the sanctions are actively aimed at reducing imports of important components for the modernization of military equipment. Thus, the Kremlin is completely isolated from any innovation and unable any time soon to become the desired dominant actor in the use of Artificial Intelligence in the military field.

Finally, given the results of the analysis of the Russian AI military production, it can be determined that currently the country is unable to become the first-tier armament producer due to vast structural limitations that it is currently facing. Moreover, the ongoing sanctional environment further limits Moscow's ability to participate in the international arena and pursue its FP goals. In doing so, the country is currently facing a political and economic bubble that has a huge potential to remain for a long time, thus, not just limiting the country to produce and invest in AI military development, but rolling back its technological development and funding by several years. Therefore, this thesis aimed to provide a comprehensive analytical and theoretical study of the Russian policy on the development of AI in the military. It was determined that, by relying on Keith Krause's (1992) theory, that Russia still is a second-tier actor. And even though the Russian policymakers are pursuing to become the dominant weapons manufacturer and indicate the AI sector as the main tool of how to achieve such status, the country still needs to face the reality of its ongoing structural limitations. Therefore, it can be concluded that (1) Russian with its numerous structural limitations (e.g., sanctions, economic, political and strategic problems) cannot compete with the dominant weapons producers by focusing on developing only one specific sector of armament; and finally (2) Russia is currently struggle to maintain its technological potential along with being a part of the arms race under its current highly challenged and limited international status.

Bibliography

Primary sources

1. The Kremlin. (2008). Foreign Policy Concept of the Russian Federation. The President of the Russian Federation. Retrieved from http://kremlin.ru/acts/news/785
2. The Kremlin. (2014). Meeting of the State Council on the development of small and medium-sized businesses. The President of the Russian Federation. Retrieved from http://kremlin.ru/events/president/news/49214
3. The Kremlin. (2015). On the National Security Strategy of the Russian Federation. The President of the Russian Federation. Decree No. 683. Retrieved from http://kremlin.ru/acts/bank/40391
4. The Kremlin. (2021). On the National Security Strategy of the Russian Federation. Official Internet portal of legal information. Retrieved from http://publication.pravo.gov.ru/Document/View/0001202107030001?index=0&rangeSize=1
5. Putin, V. (2007). A speech delivered at the MSC 2007 by the President Vladimir Putin. In Fillinger, T. (2019).The Russian Outlook on Security Issues in Speeches at the Munich Security Conference between 2007 and 2018. Masarykova univerzita. Retrieved from https://is.muni.cz/th/xlghl/DP_Fillinger_Speeches.pdf

Secondary sources

1. Allison, G. T, & Morris, F. A. (1975). Armaments and Arms Control: Exploring the Determinants of Military Weapons. Daedelus 104:99-129.
2. Aljazeera. (2022). Germany courts Qatar and UAE for alternatives to Russian gas. Aljazeera. Retrieved from https://www.aljazeera.com/news/2022/3/19/germany-courts-qatar-and-uae-for-alternatives-to-russian-gas
3. Altmann, J. & Sauer, F. (2017). Autonomous Weapon Systems and Strategic Stability. Survival 59(5):117–142
4. Army Recognition. (2019). Altius-U to become the backbone of the heavy Russian drone fleet. Army Recognition. Retrieved from https://www.armyrecognition.com/september_2019_global_defense_security_army_news_industry/altius-u_to_become_backbone_of_heavy_russian_drone_fleet.html
5. Army Recognition. (2022). Analysis: Russian and Ukrainian artillery vehicles and weapons in the Ukraine conflict. Army Recognition. Retrieved from https://www.armyrecognition.com/ukraine_-_russia_invasion_conflict_war/analysis_russian_and_ukrainian_artillery_vehicles_and_weapons_in_ukraine_conflict.html

6. Army Technology. (2022). Uran-14 Multi-Mission Unmanned Ground Vehicle. Army Technology. Retrieved from https://www.army-technology.com/projects/uran-14-multi-mission-unmanned-ground-vehicle/
7. Barno, D. & Bensahel N. (2018). War in the fourth industrial revolution. War on the Rocks. Retrieved from https://warontherocks.com/2018/06/warinthefourthin
8. Batya. (2020). Scarab Robots Deployed by Russian Forces in Syria. Reaper Feed. Retrieved from https://reaperfeed.com/scarab-robots-deployed-by-russian-forces-in-syria/
9. Bayoudh, K., Knani, R. & Hamdaoui, F. (2021). In A survey on deep multimodal learning for computer vision: advances, trends, applications, and datasets. Vis Comput (2021).
10. BBC. (2015). Brent crude oil price falls to six-year low. BBC News. Retrieved from https://www.bbc.com/news/business-30775577
11. Bendett, S. (2017). Red Robots Rising: Behind the Rapid Development of Russian Unmanned Military Systems, The Strategy Bridge
12. Bendett, S. (2019). Artificial Intelligence, China, Russia, and the Global Order (pp. 168-177,Rep.) (Wright N., Ed.). Air University Press.
13. Berls, R. E. (2021). Strengthening Russia's Influence in International Affairs, Part I: The Quest for Great Power Status. NTI. Retrieved from https://www.nti.org/analysis/articles/strengthening-russias-influence-in-international-affairs-part-i-the-quest-for-great-power-status/
14. Blanchard, B. (2015). China is restricting the export of drones because it fears they could fall into terrorists' hands. Insider. Retrieved from https://www.businessinsider.com/r-china-to-restrict-drone-supercomputer-exports-2015-8
15. BOFIT. (2022). Death rate in Russia hit historical high last year; covid infections soar. The Bank of Finland Institute forEmergence Economies. Retrieved from https://www.bofit.fi/en/monitoring/weekly/2022/vw202205_2/
16. Bosch, K. & Bronkhorst, A. (2018). Human-AI Cooperation to Benefit Military Decision Making.
17. Buchanan, B. G., Hendriks-Jansen, H., & Addis, T. (1994). The Role of Experimentation in Artificial Intelligence [and Discussion]. Philosophical Transactions: Physical Sciences and Engineering, 349(1689), 153–166.
18. Carpenter, C. (2016). Rethinking the Political/-Science-/Fiction Nexus: Global Policy Making and the Campaign to Stop Killer Robots. American Political Science Association 14(1):53–69
19. Christie, E. H., Buts, C., & Du Bois, C. (2021). America, China, and the struggle for AI supremacy. Paper presented at 24th Annual International Conference on Economics and Security, Thessaly, Greece.
20. Connolly, M. (1952). THE PLANNED ECONOMY OF THE U.S.S.R.—II. The Irish Monthly, 80(948), 220–225.

21. Council on Foreign Relations. (2022). Besides China, Putin Has Another Potential De-dollarization Partner in Asia. Asia Unbound & Asia Program. Retrieved from https://www.cfr.org/blog/besides-china-putin-has-another-potential-de-dollarization-partner-asia
22. CNA. (2021). Artificial Intelligence and Autonomy in Russia. Center For Naval Analyses. Retrieved from https://www.cna.org/CNA_files/PDF/Artificial-Intelligence-and-Autonomy-in-Russia.pdf
23. CNEWS. (2021). Russia puts its full range of combat drones on the global market. Retrieved from https://www.cnews.ru/news/top/2021-07-21_rossiya_vyhodit_na_rynok_voennyh
24. Crino, S. & Dreby, A. (2020). Turkey's Drone War in Syria – A Red Team View. Small Wars Journal. Retrieved from https://smallwarsjournal.com/jrnl/art/turkeys-drone-war-syria-red-team-view
25. Davies, R. W. (1993). Soviet Military Expenditure and the Armaments Industry, 1929-33: A Reconsideration. Europe-Asia Studies, 45(4), 577–608.
26. Defence Blog. (2015).In Russia, are developing a new UAV «Frigate». Defence Blog. Retrieved from https://defence-blog.com/in-russia-are-developing-a-new-uav-frigate/
27. Desfosses, H. (1987). The USSR and Africa. Issue: A Journal of Opinion, 16(1).
28. Downs, E. (2022). China Could Be A Lifeline for Russian Energy. Barron's. Retrieved from https://www.barrons.com/articles/china-could-be-a-lifeline-for-russian-energy-51648238894
29. DW. (2020). Russian arms exports to Africa: Moscow's long-term strategy. Retrieved from https://amp.dw.com/en/russian-arms-exports-to-africa-moscows-long-term-strategy/a-53596471
30. Egan, M. (2022). Russia faces a deep recession that will 'only get deeper,' a Treasury official says. CNN Business. Retrieved from https://edition.cnn.com/2022/04/01/economy/russia-recession-ruble/index.html
31. Episkopos, M. (2021). How Russia Became Africa's Dominant Arms Dealer. The National Interest. Retrieved from https://nationalinterest.org/blog/buzz/how-russia-became-africa's-dominant-arms-dealer-178656
32. EPRS. (2018). Seven economic challenges for Russia. Breaking out of stagnation? European Parliamentary Research Service. Retrieved from https://www.europarl.europa.eu/RegData/etudes/IDAN/2018/625138/EPRS_IDA(2018)625138_EN.pdf
33. Fahim, K. (2020). Turkey's military campaign beyond its borders is powered by homemade armed drones. The Washington Post. Retrieved from https://www.washingtonpost.com/world/middle_east/turkey-drones-libya-nagorno-karabakh/2020/11/29/d8c98b96-29de-11eb-9c21-3cc501d0981f_story.html

34. Ferguson, J. & Jenzen-Jones, N.R. (2014). Raising Red Flags: An Examination of Arms & Munitions in the Ongoing Conflict in Ukraine. ARES. Research Report No. 3. Retrieved from https://armamentresearch.com/Uploads/Research%20Report%20No.%203%20-%20Raising%20Red%20Flags.pdf
35. FOCUSECONOMICS. (2022). Russia: Ruble recovers lost ground despite worsening economic backdrop. Retrieved from https://www.focus-economics.com/countries/russia/news/politics/ruble-recovers-lost-ground-despite-worsening-economic-backdrop
36. FPRI. (2018). How Russia survived sanctions. Foreign Policy Research Institute. Retrived from https://www.fpri.org/article/2018/05/how-russia-survived-sanctions/
37. Gaffen, D. (2022). Oil blasts through $110/bbl, as few alternatives are seen to Russian supply. Reuters. Retrieved from https://www.reuters.com/business/energy/oil-jumps-3-choked-russian-supply-trade-finance-dries-up-2022-03-02/
38. Gavrilov, Y. (2020). The Russian Army will receive 35 Msta-SM self-propelled howitzers by the end of the year. Russkoe Oruzie. Retrieved from https://rg.ru/2020/05/05/rossijskaia-armiia-do-konca-goda-poluchit-35-samohodnyh-gaubic-msta-sm.html
39. Gleditsch, K. S. & Weidmann, N. B. (2020). From hand-counting to GIS: Richardson in the information age. Ch. 7 in this volume.
40. Gray, C. S. (1971). The Arms Race Phenomenon, World Politics, Vol. 24, No. 1, pp. 39-79.
41. Hagstrom, M. (2019). Military Applications of machine learning and autonomous systems. In SIPRI. (2019). The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk, Volume I, Euro-Atlantic perspectives. Retrieved from https://www.sipri.org/publications/2019/other-publications/impact-artificial-intelligence-strategic-stability-and-nuclear-risk-volume-i-euro-atlantic
42. Hall, J. A. & Schroeder, R. (2005). An Anatomy of Power. The Social Theory of Michael Mann. Cambridge University Press
43. Haner, J. & Garcia, D. (2019). The Artificial Intelligence Arms Race: Trends and World Leaders in Autonomous Weapons Development. Global Policy Volume 10. Issue 3. Retrieved from https://onlinelibrary.wiley.com/doi/epdf/10.1111/1758-5899.12713
44. Hess, M. (2022). What will Russia's post-invasion economy look like? Aljazeera. Retrieved from https://www.aljazeera.com/opinions/2022/3/31/russias-post-invasion-political-economy
45. Hindustan News Hub. (2021). Kronshtadt Orion: Russia showed the power of 'drone killer' Orion UAV, flew air targets on the Ukraine border like this. Retrieved from https://hindustannewshub.com/world-news/kronshtadt-orion-russia-showed-the-power-of-drone-killer-orion-uav-flew-air-targets-on-ukraine-border-like-this/

46. Holsti, K. J. (1970). National Role Conceptions in the Study of Foreign Policy. International Studies Quarterly, Vol. 14
47. Howe, J. (2007). ARTIFICIAL INTELLIGENCE AT EDINBURGH UNIVERSITY : A PERSPECTIVE. The University of Edinburgh School of Informatics. Retrieved from https://www.inf.ed.ac.uk/about/AIhistory.html
48. HRW (Human Rights Watch). (2012). Losing Humanity. The Case against Killer Robots. Retrieved from https://www.hrw.org/report/2012/11/19/losing-humanity/case-against-killer-robots
49. HRW (Human Rights Watch). (2016). Killer Robots and the Concept of Meaningful Human Control. Memorandum to Convention on Conventional Weapons (CCW) Delegates. Retrieved from https://www.hrw.org/news/2016/04/11/killer-robots-and-concept-meaningful-human-control
50. Hynek, N. & Solovyeva, A. (2020). Operations of power in autonomous weapon systems: ethical conditions and socio‐political prospects. AI & Society.
51. IIWORKS. (2021). From the screw. The military will receive attack drones-helicopters “Platform”. IIWORKS. Retrieved from https://iiworks.com/from-the-screw-the-military-will-receive-attack-drones-helicopters-platform/
52. Insight Turkey. (2021). The Role of Turkish Drones in Azerbaijan’s Increasing Military Effectiveness: An Assessment of the Second Nagorno-Karabakh War. Insight Turkey Fall 2021 / Volume 23 Number 4. Retrieved from https://www.insightturkey.com/article/the-role-of-turkish-drones-in-azerbaijans-increasing-military-effectiveness-an-assessment-of-the-second-nagorno-karabakh-war
53. Interpolitex. (2015). "Scarab and Sphere: Small Robots for Specialists and Rescuers at Interpolitex 2015. Interpolitex. Retrieved from https://www.interpolitex.ru/media/news/novosti-vystavki/skarabey-i-sfera-malenkie-roboty-dlya-spetsov-i-spasateley-na-vystavke-interpolitekh-2015/
54. Kashif, M. & Arslan, M. & Chakma, R. & Banoori, F. & Al-Mamun, A. & Chakma, G. (2018). Design and Implementation of Image Capture Sentry Gun Robot. MATEC Web of Conferences.
55. Kashin, V. (2019). The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk: Volume II East Asian Perspectives (pp. 39-42, Rep.) (SAALMAN L., Ed.). Stockholm International Peace Research Institute.
56. Kazantsev, S. V. (2014). The Importance of the Defence-Industrial Complex for the Rise of the Russian Economy. Financial journal No 1 2014. Retrieved from https://www.nifi.ru/images/FILES/Journal/Archive/2014/1/05_1_2014.pdf
57. Keefe, J. R. (2009). Stalin and the Drive to Industrialize the Soviet Union. Inquiries Journal/Student Pulse, 1(10). Retrieved from http://www.inquiriesjournal.com/a?id=1684

58. Kirsanov, S. & Safonov, E. & Ramirez, S. (2016). NATURAL MONOPOLY IN RUSSIA: STATE REGULATION PROBLEMS. Baltic Journal of Real Estate Economics and Construction Management.
59. Korb, L. J. (1991). Spending Machine Is Stuck in High Gear : Military: Budgets sound more modest than they really are. It makes little sense to 'protect' defense for another two years. Los Angeles Times. Retrieved from https://www.latimes.com/archives/la-xpm-1991-11-26-me-17-story.html
60. Kofman, M. (2017). The Russian Defense Budget and You, Russia Military Analysis, available online at https://russianmilitaryanalysis.wordpress.com/2017/03/17/the-russian-defense-budget-and-you/
61. Korhonen, I. (2019). Sanctions and Counter-Sanctions - What Are their Economic Effects in Russia and Elsewhere? Journal of the New Economic Association, New Economic Association, vol. 43(3)
62. Korhonen, I. (2021). Economic Sanctions on Russia and their Effects, Part II. NYU Jordan Center for the Advanced Study of Russia. Retrieved from https://jordanrussiacenter.org/news/economic-sanctions-on-russia-and-their-effects-part-ii/#.Ymlwoi8RpQI
63. Kozyulin, V. (2019). Militarization of AI from a Russian Perspective.Conference: The Militarization of Artificial Intelligence
64. Joy. (2021). From Tanks to Jets: Russia's Growing African Arms Trade. African Peace. Retrieved from https://africanpeace.org/from-tanks-to-jets-russias-growing-african-arms-trade/
65. Krause, K. (1992). Arms and the State: Patterns of Military Production and Trade. Cambridge: Cambridge University Press
66. Kretzul, R. & Cherepanova, A. (2021). Attack Uranus: combat robot hunters go to the "West". What kind of test awaits new unmanned systems? Izvestia. Retrieved from https://iz.ru/1215733/roman-kretcul-anna-cherepanova/nanesti-uran-boevye-roboty-okhotniki-edut-na-zapad
67. Kumagai, J. (2007). A Robotic Sentry For Korea's Demilitarized Zone. IEEE Spectrum, vol. 44, no. 3
68. Kuo, K. (2021). Military Innovation and Technological Determinism: British and US Ways of Carrier Warfare, 1919–1945, Journal of Global Security Studies, Volume 6, Issue 3
69. Laszlo, B. (2022). The Russian Air Force has unveiled the Hunter drone. Flying Cars Market. Retrieved from https://flyingcarsmarket.com/the-russian-air-force-has-unveiled-the-hunter-drone/
70. Leonovich, A. N. (2014). MILITARY INDUSTRY OF THE RUSSIAN FEDERATION IN THE LATE XX-EARLY XXI CENTURY. Retrieved from https://www.researchgate.net/publication/277553334_Russian_Federation_Defense_Industry_at_the_end_of_20th_-_Beginning_21st_Century/fulltext/57aa1bac08ae42ba5

2ac1325/Russian-Federation-Defense-Industry-at-the-end-of-20th-Beginning-21st-Century.pdf.

71. Longley, R. (2020). Why Did the Soviet Union Collapse? How the Cold War Ended. ThoughtCo. Retrieved from https://www.thoughtco.com/why-did-the-soviet-union-collapse-4587809
72. Luke, T. W. (1985). Technology and Soviet Foreign Trade: On the Political Economy of an Underdeveloped Superpower. International Studies Quarterly, 29(3), 327–353.
73. Maiolo, J. (2016). Introduction. Ch. 1 in: Thomas Mahnken, Joseph Maiolo & David Stevenson (eds) Arms Races in International Politics: From the Nineteenth to the Twenty-first Century. Oxford: Oxford University Press, 1–10.
74. Maltsev, A. A. & Azarov, D. A. (2014). Prospects for the development of the military-industrial complex of the Russian Federation in the context of sanctions. Proceedings of the Ural State University of Economics
75. Marcus, J. (2016). Russia and the West: Where did it all go wrong? BBC News. Retrieved from https://www.bbc.com/news/world-middle-east-37658286.amp
76. Masters, J. (2022). Ukraine: Conflict at the Crossroads of Europe and Russia. Council on Foreign Relations. Retrieved from https://www.cfr.org/backgrounder/ukraine-conflict-crossroads-europe-and-russia#chapter-title-0-5
77. McFarland, T. (2015). Factors shaping the legal implications of increasingly autonomous military systems. International Review of the Red Cross. 97 (900), 1313–1339. Retrieved from https://library.icrc.org/library/docs/DOC/irrc-900-mcfarland.pdf
78. MEMO (Middle East Monitor). (2021). Ukraine to order 24 Turkish drones. Retrieved from https://www.middleeastmonitor.com/20210915-ukraine-to-order-24-turkish-drones/
79. Military Leak. (2021). Russian Armed Forces to Receive 20 Uran-9 Unmanned Combat Ground Vehicle. Retrieved from https://militaryleak.com/2021/04/11/russian-armed-forces-to-receive-20-uran-9-unmanned-combat-ground-vehicle/
80. Miller, S. E. & Trenin, D. V. (2005). The Russian Military: Power and Policy, Cambridge, MA: MIT Press, 2004.. Journal of Power Institutions in Post-Soviet Societies.
81. Moravcsik, A. (1991). Arms and autarky in modern European history. Daedalus, 120(4), 23–45.
82. Nature. (2022). The countries maintaining research ties with Russia despite Ukraine. Retrieved from https://www.nature.com/articles/d41586-022-00945-3

83. NDAA FY. (2019). John S. McCain National Defense Authorization Act for Fiscal Year 2019.Public Law 115–232 115th Congress. Congress Gov. Retrieved from https://www.congress.gov/115/plaws/publ232/PLAW-115publ232.pdf

84. Nield, T. (2019). Is Deep Learning Already Hitting its Limitations? And Is Another AI Winter Coming? Towards Data Science. Retrieved from https://towardsdatascience.com/is-deep-learning-already-hitting-its-limitations-c81826082ac3
85. O'Connor, T. (2021). Russia Is Building an Army of Robot Weapons, and China's AI Tech Is Helping. Newsweek. Retrieved from https://www.newsweek.com/russia-building-army-robot-weapons-chinas-ai-tech-helping-1594362
86. O'Connor, T. (2022). Xi and Putin, Two of World's Most Powerful Men, to Meet in China, US Absent. Newsweek. Retrieved from https://www.msn.com/en-us/news/newsworld/xi-and-putin-two-of-world-s-most-powerful-men-to-meet-in-china-us-absent/ar-AATrPOY
87. Office of the President of the Russian Federation. (2019). Decree of the President of the Russian Federation on the Development of Artificial Intelligence in the Russian Federation. Center of Security and Emerging Technology. Retrieved from https://cset.georgetown.edu/publication/decree-of-the-president-of-the-russian-federation-on-the-development-of-artificial-intelligence-in-the-russian-federation/
88. OHCHR. (2013). Statement of Christof Heyns Special Rapporteur on extrajudicial, summary or arbitrary executions. The United Nations. Retrieved from https://www.ohchr.org/en/statements/2013/06/statement-christof-heyns-special-rapporteur-extrajudicial-summary-or-arbitrary
89. Ohlson, T. (1982). Third World arms exporters: a new facet of the global arms race', Bulletin of Peace Proposals in Holsti, K. J. (1970). National Role Conceptions in the Study of Foreign Policy. International Studies Quarterly, Vol. 14
90. Oryx. (2022). Attack on Europe: Documenting Russian Equipment Losses during the 2022 Russian Invasion of Ukraine. Oryx. Retrieved from https://www.oryxspioenkop.com/2022/02/attack-on-europe-documenting-equipment.html?m=1
91. OSW STUDIES. (2017).Crisis in Russia. The degradation of the model of economic governance. Center for Eastern Studies (OSW). Retrieved from https://www.osw.waw.pl/en/publikacje/osw-studies/2017-03-03/crisis-russia-degradation-model-economic-governance
92. OVD. (2019). Russia Testing Kungas UGV Family. Over the Defence. Retrieved from https://www.overtdefense.com/2019/12/10/russia-testing-kungas-ugv-family/
93. RAND. (2019). Trends in Russia's Armed Forces, An Overview of Budgets and Capabilities.RAND Corporation, Santa Monica, Calif. Retrieved from https://www.rand.org/content/dam/rand/pubs/research_reports/RR2500/RR2573/RAND_RR2573.pdf

94. RBC. (2019). Economists estimate Russia's losses from sanctions at ₽800bn. Retrieved from https://www.rbc.ru/economics/14/08/2019/5d51780c9a7947cd5eb6eb56
95. RBC. (2021). Defense expenditures have been beaten back by the previous budget. Retrieved from https://www.rbc.ru/newspaper/2021/10/04/61571a279a79478e0bc0b011
96. Realnoe Vremya. (2021). Russia will spend more than 3.5 trillion rubles on defense in 2022 - is it a lot or a little? Retrieved from https://m.realnoevremya.ru/news/227662-rossiya-potratit-v-2022-godu-na-oboronu-bolee-35-trln-rubley
97. Report to Congressional Requesters. (2001). Electronic Warfare: Comprehensive Strategy Needed for Suppressing Enemy Air Defenses. Retrieved from https://www.govinfo.gov/content/pkg/GAOREPORTS-GAO-01-28/html/GAOREPORTS-GAO-01-28.htm
98. Reuters. (2022). Four weeks of war scar Russia's economy. Retrived from https://www.reuters.com/world/europe/four-weeks-war-scar-russias-economy-2022-03-24/
99. Richardson, L. F. (1960). Arms and Insecurity: A Mathematical Study of the Causes and Origins of War. Pittsburgh, PA: Boxwood
100. Roberts, M. (1976). The military revolution, 1560-1660', reprinted in Essays in Swedish History, London
101. Robertson, H. (2022). Putin's war in Ukraine is devastating Russia's economy, wiping out 15 years of growth and sending inflation skyrocketing. Insider. Retrieved from https://www.businessinsider.com/russia-economy-gdp-crash-ukraine-war-inflation-sanctions-energy-putin-2022-3
102. Rodgers, A. (1960). [Review of The Soviet Aluminum Industry, by T. Shabad]. Geographical Review, 50(2), 310–312.
103. Rostec. (2020). All Armed: The Russian Army Continues to Renew. Retrieved from https://rostec.ru/news/vo-vseoruzhii-rossiyskaya-armiya-prodolzhaet-obnovlenie/
104. Rumer, E. & Sokolsky, R. (2022). Putin’s War Against Ukraine and the Balance of Power in Europe. Carnegie Endowment for International Peace. Retrieved from https://carnegieendowment.org/2022/04/11/putin-s-war-against-ukraine-and-balance-of-power-in-europe-pub-86832
105. Russell, S. & Norvig, P. (2003). Artificial Intelligence, A Modern Approach. Second Edition.
106. Scharre, P. (2019). The Real Dangers of an AI Arms Race. Foreign Affairs, 9 (3).

107. Schwab, K. (2018). The Fourth Industrial Revolution. World Economic Forum. Retrieved from https://www.weforum.org/pages/thefourthindustrialrevolutionby klausschwab

108. Sharathkumar, N. (2022). A closer look at Russia's AI-powered artillery. Tech Policy. Retrieved from https://analyticsindiamag.com/a-closer-look-at-russias-ai-powered-artillery/

109. Shuster, S. (2014). Putin's Loss of German Trust Seals the West's Isolation of Russia. TIME. Retrieved from https://time.com/3590588/putin-merkel-germany-russia/

110. SIPRI. (2017). MAPPING THE DEVELOPMENT OF AUTONOMY IN WEAPON SYSTEMS. STOCKHOLM INTERNATIONAL PEACE RESEARCH INSTITUTE. Retrieved from https://www.sipri.org/sites/default/files/2017-11/siprireport_mapping_the_development_of_autonomy_in_weapon_systems_1117_0.pdf

111. Sokolov, A. V. (2009). ANALYSIS OF THE FINANCIAL AND ECONOMIC SITUATION OF DEFENSE INDUSTRY ENTERPRISES IN THE RUSSIAN FEDERATION IN 2000-2007. Institute of Economics and Industrial Engineering, Siberian Branch, Russian Academy of Sciences. Retrieved from https://nsu.ru/xmlui/bitstream/handle/nsu/2893/04.pdf?sequence=1&isAllowed=y

112. Stanovaya, T. (2021). Putin's Grip on Power: The Beginning of the End? Institut Montaigne. Retrieved from https://www.institutmontaigne.org/en/blog/putins-grip-power-beginning-end

113. Steinberg, D. (1990). Trends in Soviet Military Expenditure. Soviet Studies, 42(4), 675–699.

114. Stohl, R. J, & Grillot, S. (2009). The international arms trade. Cambridge: Polity.

115. Svenmarck, P. & Luotsinen, L. & Nilsson, M. & Schubert, J. (2018). Possibilities and Challenges for Artificial Intelligence in Military Applications.

116. Suchman, M. C., & Eyre, D. P. (1992). Military Procurement as Rational Myth: Notes on the Social Construction of Weapons Proliferation. Sociological Forum, 7(1), 137–161.

117. Swanson, A. (2022). U.S. announces sweeping restrictions on technological exports to Russia. The New York Times. Retrieved from https://www.nytimes.com/2022/02/24/business/us-announces-sweeping-restrictions-on-technological-exports-to-russia.html

118. Szabadfoldi, I. (2021). Artificial Intelligence in Military Application – Opportunities and Challenges. Land Forces Academy Review. 26. 157-165. 10.2478/raft-2021-0022.

119. Szondy, D. (2015). US Army tests remote controlled weapon towers. New Atlas. Retrieved from https://newatlas.com/us-army-tests-remote-controlled-weapon-towers/39670/
120. Tadjdeh, Y. (2021). Algorithmic Warfare: Russia Expanding Fleet of AI-Enabled Weapons. National Defense. Retrieved from https://www.nationaldefensemagazine.org/articles/2021/7/20/russia-expanding-fleet-of-ai-enabled-weapons
121. Tadviser. (2020). National Strategy for the Development of Artificial Intelligence in Russia. Retrieved from https://tadviser.com/index.php/Article:National_Strategy_for_the_Development_of_Artificial_Intelligence
122. Tadviser. (2022).National Strategy for the Development of Artificial Intelligence in Russia. Retrieved from https://tadviser.com/index.php/Article:National_Strategy_for_the_Development_of_Artificial_Intelligenc
123. The Defence Post. (2021). Russia's 'Orion' Drone to Get Electronic Warfare System. The Defence Post. Retrieved from https://www.thedefensepost.com/2021/08/23/russia-orion-drone-electronic-warfare-system/
124. The Guardian. (2022). Russia heading for deepest recession since Soviet collapse, UK warns, as inflation jumps – as it happened. Retrieved from https://www.theguardian.com/business/live/2022/apr/08/air-travel-uk-airports-disruption-easter-getaway-roads-dover-cost-of-living-business-live
125. Thee, M. (1976). THE NUCLEAR ARMS RACE: TRENDS, DYNAMICS, CONTROL. Instant Research on Peace and Violence, 6(1/2), 18–28.
126. The Moscow Times. (2014). Battle Robots to Guard Russian Missile Silos by 2020. Moscow Times. Retrieved from http://themoscowtimes.com/articles/battle-robots-to-guard-russian-missile-silos-by-2020- 38460e
127. The Moscow Times. (2022). Western Companies' Exodus from Russia Leaves Thousands of Russians' Livelihoods on the Line. Retrieved from https://www.themoscowtimes.com/2022/03/10/western-companies-exodus-from-russia-leaves-thousands-of-russians-livelihoods-on-the-line-a76811
128. The NY Times. (2006). Russian Deal to Create World's Biggest Aluminum Maker. Retrieved from https://www.nytimes.com/2006/10/10/business/worldbusiness/10alum.html
129. The UN. (2019). The Militarization of Artificial Intelligence. Stanley Center for Peace and Security. Retrieved from https://reliefweb.int/sites/reliefweb.int/files/resources/TheMilitarization-ArtificialIntelligence.pdf
130. Thomas, G. M. & Lauderdale, P. (1988). State authority and national welfare programs in the world system context. Sociological Forum 3:383-399.

131. Thurnher, J. S (2012). Legal implications of the fully autonomous targeting. NDU Press. Retrieved from https://ndupress.ndu.edu/Portals/68/Documents/jfq/jfq-67/JFQ-67_77-84_Thurnher.pdf

132. Trudolyubov, M. (2022). Russia's Catastrophic Geopolitics. Wilson Center. Retrieved from https://www.wilsoncenter.org/blog-post/russias-catastrophic-geopolitics

133. Tsygankov, A.P. (2008). Russia's International Assertiveness: What Does It Mean for the West? Problems of Post-Communism, 55:2, 38-55

134. Turing, A. M. (1950). Computing machinery and intelligence. Mind, 59, 433–460.

135. Turner, S. (2009). RUSSIA, CHINA AND A MULTIPOLAR WORLD ORDER: THE DANGER IN THE UNDEFINED. Asian Perspective, 33(1), 159–184.

136. US Department of the Treasury. (2014). Ukraine-/Russia-related Sanctions. SECTORAL SANCTIONS IDENTIFICATIONS (SSI) LIST. U.S Department of the Treasury. Retrieved from https://home.treasury.gov/policy-issues/financial-sanctions/sanctions-programs-and-country-information/ukraine-russia-related-sanctions

137. Vedomosti. (2021). Russia uses Uranium-9 and Nerekhta robots for the first time in a military exercise. Retrieved from https://www.vedomosti.ru/society/news/2021/09/13/886447-rossiya-vpervie-primenila-roboti-uran-9-i-nerehta

138. Vershinin, M. (2020). The upgraded Msta-SM arrives in the army. PopMech. Retrieved from https://www.popmech.ru/weapon/news-606573-modernizirovannaya-msta-sm-postupila-v-voyska/

139. Wodecki, B. (2022). Russia's AI Army: Drones, AI-Guided Missiles and Autonomous Tanks. A look at Russia's autonomous military capabilities as war rages in Ukraine. IOT World Today. Retrieved from https://www.iotworldtoday.com/2022/02/27/russias-ai-army-drones-ai-guided-missiles-and-autonomous-tanks/

140. Woolf, A. F. (2022). Russia's Nuclear Weapons: Doctrine, Forces, and Modernization. Congressional Research Service. Retrieved from https://sgp.fas.org/crs/nuke/R45861.pdf

141. WPR (World Politics Review). (2022). Can Putin Change Russia's Role From Spoiler to Global Power? Retrieved from

https://www.worldpoliticsreview.com/insights/27815/russia-s-putin-crafts-an-unusual-role-in-the-global-order

142. Yale. (2022). Over 750 Companies Have Curtailed Operations in Russia—But Some Remain. Yale School of Management. Retrieved from https://som.yale.edu/story/2022/over-750-companies-have-curtailed-operations-russia-some-remain

143. Zubovich, A. S. (2010). Exports of Russian military products: volumes are growing. Russian Foreign Economic Bulletin.

Appendix

Diploma thesis project

Analysis of Russian policy on the development of AI in the military

Name: Kseniia Miliutina

Academic advisor: Dr Tomáš Kučera

Study programme: International Security Studies Year of project submission: 2021

1. Introduction

The interest in relying on Artificial intelligence (AI) technologies is rapidly growing among many countries. Many of them tend to integrate such modern mechanisms in prioritized areas including the security field. Policymakers tend to invest in the development of these initiatives in order to modernize a country's technological capabilities. In the case of Russia, "it is expanding its artificial intelligence (AI) efforts due to the increasing attention that the nation's government is paying to the development of AI-assisted and AI-facilitated technologies" (Bendett, 2019). It can be explained by the Kremlin's initiative to maintain its competitiveness among other international actors and preserve its strong political Image. However, the Russian Federation has never been a leader in the research on AI. Moreover, "by being one of the biggest countries, it lacks a comprehensive national programme for AI development" (Kashin, 2019), since the country started to pay its attention to this field not that long ago.

The Russian government defines AI development as a key priority for the state's military field. "It has relatively straightforward defense policies that have been designed to maintain the credibility of its deterrence capabilities and the competitiveness of its domestic defense industries" (Ibid). Therefore, by following a strong desire to have highly compatible security capabilities, the Kremlin focuses on the development of AI innovations and its usage in creating autonomous weapons systems (AWS) that tend to limit human activity and responsibility for targeted subjects. This proactive initiative raises international awareness over its rightfulness since it has various shortcomings on people's security including the lack of ethics of its usage in combat. Moreover, Russia's unwillingness to accept an international prohibition on autonomous weapon systems in the military raises further concerns over its possible outcomes on AI regulation, regional, and global military and political power dynamics.

2. Research Target and Research Question

Considering that the Kremlin is opposing the ban on the use of lethal autonomous weapons systems (LAWS) and the military use of AI and has already adopted a National Strategy for the Development of Artificial Intelligence through 2030, this study aims to examine the reasons behind the Russian desire to produce weaponized AI and what shortcoming it may have on security dynamics at different levels including the current LAWS regulations. By

doing so, Keith Krause's theory on global arms production and military technology diffusion will be used as a theoretical framework for conducting a comprehensive analytical research. His division of three tiers of arms suppliers will be considered as a basis for the development of independent findings regarding history, policies and main factors behind the growth of Russian AWS. The Kremlin's pro-active policy on the development of AI in the military will be used as the main case of study that falls under Krause's observations and prompts further analytical research.

According to Keith Krause, "arms suppliers and producers usually follow a conventional tripartite division into economic, political and military motives" (Krause, 1992). However, Andrew Moravcsik states that the major motivation for the improvement of a country's defense capabilities is not strictly nationally oriented (Moravcsik, 1991). Instead, this desire is more multidimensional and shall be analyzed by including other factors, such as commercial interests, domestic/foreign political complexity and many others (Ibid). Therefore, due to the complexity of this topic, the research of the case study will be carried out by using different levels of analysis. In doing so, there will be determined several key actors that are interested in AI military implications such as the armed forces and its individual services/branches, non-governmental/private subjects, Ministry of Defense (MoD), Ministry of Foreign Affairs (MFA), and the President.

Moreover, the study stresses to address concerns regarding possible limitations and outcomes of the large production of weaponized AI in Russia. It should be noted that the current Russian AWS are highly limited due to the inability of robotic devices to think beyond their program as well as to replicate pure human behavior. These limitations can have long-term shortcomings on society since there is a lack of morality in the AI's practices. In addition to that, it is important to define how the Russian AWS systems development may affect the initiative in AI regulations. By analyzing the limits of AI's robustness that challenge the reliability of AWSs this work will stress the necessity for further regulations and control.

Literature Review

To satisfy the objectives, the information used in this study was gathered and organized by analyzing different primary and secondary articles and scholarly papers. Moreover, it was divided into two different categories. The first one tends to address the theoretical and conceptual frameworks of this research in order to define the development and further

diffusion of military production. There will be acknowledged three waves of its development and their evolutionary dynamics by relying on Keith Krause work *Arms and the state: patterns of military production and trade (1992)* where there was addressed the technological improvement of the military field along with its rapid evolutionary dynamics. Additionally, his proposed structuralisation of the research methods of arms production helps to identify key reasons and motivations behind a country's rapid arms development. Meanwhile, the *Arms and Autarky in Modern European History (1991)* by Andrew Moravcsik reveals the need to use further levels of analysis to identify different actors that are interested in such activity. For example, "much of the technological progress resulted from the extraordinary dynamism of private enterprise" (Ibid).

The second category tends to address the case of study by gathering and analyzing information regarding the history and the reasons behind the development of AWS in Russia. *Red Robots Rising: Behind the Rapid Development of Russian Unmanned Military Systems (2017)* and *Artificial Intelligence, China, Russia, and the Global Order (2019)* by Samuel Bendett, *The Russian Defense Budget and You (Russia Military Analysis) (2017)* and other works of Michael Kofman will be analyzed accordingly.

Finally, there will be critically analyzed various Russian primary sources to develop independent opinions regarding the key motivators in AWS production and integration in the military field. Last but not least, the study of international sources will contribute to the formation of the answer to the research questions. Therefore, the use of different sources will bring a new standpoint on current Russian policy on AI's military integration and how it affects already existing international regulations.

Conceptual and Theoretical Framework

As it was outlined earlier, the theoretical framework of this work will be based on Keith Krause observation of the modern stage of arms production. According to him, there were three waves of its development. The first one belongs to the so-called military revolution which took place between the 15-17th centuries. Then, it continued with the period of the industrial revolution (from mid 19th till the beginning of 20th century) as a second wave. The third wave started after the First World War and is still present. Krause believed that evolutionary dynamics pushed countries to adjust to them and formulated several patterns for different types of behavior. Later, they were indicated as *three tiers*. The first-tier

producer/supplier(s) are introduced by superpowers that actively pursue their military capabilities through high technological development. These countries are “able not only to innovate and advance the technological frontier but also to produce weapons systems for all military applications" (Krause, 1992). Examples of the first tier of producers are the Soviet Union and the United States during the Cold War. Nowadays, only the US is considered the main superpower.

The second tier is mainly introduced by European industries that "were developed in the 1960s and 1970s with infusions of military technologies from first-tier states". "The process of its formation was pushed by a large decline of demand for arms imports and the growth of export which completely re-shaped the arms market” (Ibid). According to Keith Krause, the second tier suppliers are mainly motivated by the “shared a common dilemma that determined their position in the arms transfer system” (Ibid). Thus, they tend to actively pursue their national policies and rapid industrialisation process to “reproduce the most advanced weapons that are developed by superpowers” (Ibid).

However, this large competition over the primacy in the arms production has contributed to the indication of the third tier countries which can be characterized as actors that are “fundamentally motivated to produce arms by a desire to escape or ameliorate their subordinate position in the global arms transfer and production system” (Ibid). The actors that are falling under this category mainly tend to develop cheap and low-quality technologies. Also, such countries might be highly dependent on “imports of critical sophisticated subsystems, and little or no transfer of the knowledge required to go beyond the simple reproduction or copying of weapons occurs” (Ibid).

According to the before-mentioned theoretical patterns, the case of the Russian initiative in the production of AWS can be considered as an example of a second-tier country. As it was outlined earlier, this category of states tends to pursue its national interests and want to compete with the superpowers in military production to gain more power. However, other scholars tend to believe that state motivations in developing military production are not always strictly nationally oriented. For instance, Andrew Moravcsik states that there should be other motivators and motivations at different levels, e.g commercial interests, domestic/foreign political complexity and many others (Moravcsik, 1991). By following this idea, Barry Buzan and Eric Herring indicated in their book on *The Arms Dynamic in World Politics (1998)* that different security threats can also push international actors to acquire

arms, thus creating an environment for further process of military race. Nevertheless, all the above-mentioned stand-points must be considered to conduct a successful analysis of the case of study.

Empirical Data and Analytical Technique

The research will be carried out based on analytical research of the case of study. It is aimed to address the use of AI in the Russian military and its possible shortcomings on the current regulations of use of AWS. Due to the complexity of this topic, the research will rely on the deep theoretical background to determine current practices, policies and motivations of the Kremlin's proactive initiative in unmanned arms production. Moreover, the goal of this thesis is to develop a further independent understanding of the factors that explain Russian desire in production of weaponized AI. Last but not least, the vast analytical techniques will help to finalize the findings on the topic and determine possible shortcomings of the Kremlin's technological growth on current AWS regulations.

3. Planned thesis outline

To address the questions of this thesis, the structure will be divided accordingly. Firstly, the introduction section will be aimed at defining the research subject and its relevance as well as the short information regarding the used methodology and literature review. Then, the theoretical-analytical and conceptual frameworks based on Keith Krause's theory on global arms production and military technology diffusion will be indicated. It should be noted that the scholar was mainly oriented on analyzing the technology diffusion and arms production until the end of the Cold War period. Therefore, the thesis goes beyond these observations and addresses the case of the rapid process of integration of AI in the military field. Thus, the production of AWS will be placed in the already existing Krause's evolutionary dynamics of arms suppliers/producers.

Then, the discussion will be followed by addressing the case of rapid integration of Russian policy on the use of AI in the military. The theory of global arms production and military technology diffusion will be applied accordingly and used for conducting independent observations. Key points of Russian AWS production will be analyzed, such as key actors, their motivations and possible limitations and outcomes of the large production of weaponized AI and how it may affect current international regulations.

The structure of the thesis is expected to be as such:

Introduction: the introduction to the researched topic, methodology, literature review; **Chapter 1.** Conceptual and theoretical framework

I. Global arms production and military technology diffusion according to Krause 1.1 historical framework of Krause theory

1.2 Conceptual framework of Krause theory

1.3 Analytical framework of Krause theory:

a. three waves of the production of systems

b. five evolutionary dynamics/phases that produced:

- 1st tier;
- 2nd tier;
- 3rd tier;

  1.4 Factors that explain the desire for production and export:
- regional security dynamics;
- domestic factors: economic/ political-economic

  Chapter 2. Empirical- analytical analysis: the rise of production of weaponized AI intelligence

  2.1 The development of AI in the military field as a part of Klause's five evolutionary dynamics;

  2.2 The production of weaponized AI and its relations with the current AI regulations;

  Chapter 3. Empirical- analytical analysis of the case of study

  3.1 The current development weaponized AI intelligence in Russia and its relations with the current AI regulations (as a part of the 2nd tier)

  3.2 The key actors in the development of AI in the Russian military industry

  a. MFA and President;

  b. Armed Forces;

  c. Additional state industries; d. Private investors;

3.3 Factors that explain the desire for the production of weaponized AI in Russia based on Krause theory;

3.4 Independently established factors that explain the desire of production of weaponized AI in Russia;

3.5 Possible limitations and outcomes of the large production of weaponized AI in Russia in relation to current regulations.

Chapter 4. Conclusions **Preliminary list of references**

1. Bendett, S. (2017). Red Robots Rising: Behind the Rapid Development of Russian Unmanned Military Systems, The Strategy Bridge
2. Bendett, S. (2019). Artificial Intelligence, China, Russia, and the Global Order (pp. 168-177,Rep.) (Wright N., Ed.). Air University Press.
3. Buzan, Barry. & Herring, Eric. & Buzan, Barry. (1998). The arms dynamic in world politics. Boulder, Colo. London : Lynne Rienner
4. Kashin, V. (2019). The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk: Volume II East Asian Perspectives (pp. 39-42, Rep.) (SAALMAN L., Ed.). Stockholm International Peace Research Institute
5. Kofman, M. (2017). The Russian Defense Budget and You, Russia Military Analysis, available online at https://russianmilitaryana lysis.wordpress.com/2017/03/17/the-russian-defense-budget-and-you/
6. Krause, K. (1992). Arms and the State: Patterns of Military Production and Trade (Cambridge: Cambridge University Press
7. Moravcsik, A. (1991). Arms and autarky in modern European history. Daedalus, 120(4), 23–45.