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GENERÁLA MILANA RASTISLAVA ŠTEFÁNIKA

Armed Forces Academy
of General Milan Rastislav Štefánik

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MILITARY LEADERSHIP CULTURE IN THE HUNGARIAN DEFENCE FORCES

Péter SZÜCS

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ABSTRACT

Military leadership culture is one of the most influential factors of military leadership and its quality determines the success of leadership. Its value and strength lie in how much the leader believes in it and how much he can convey it. While leadership thinking is a process aimed at problem solving and finding its most appropriate way in the system of tasks, military leadership culture is a complex phenomenon that includes the values that the leader, together with his or her subordinates, creates or nurtures to achieve his or her own goal and the intent of a higher commander. The evolution of leadership culture in a leader is a lengthy process and the goal is to raise it to an appropriate, effective level. Maturity is the key to the leader being able to consciously communicate common values. This is based on a good leadership culture.

KEYWORDS

military leader, leadership culture, organizational culture, Hungarian Defence Force, military leadership culture models

INTRODUCTION

In the last thirty years, the Hungarian Defence Forces have changed from a mass army to a volunteer force. It was a very long and complex process, full of challenges. The challenges set demands on the entire force that radically changed everything. The documents governing the operation, the organizational structures and the combat equipment changed, and with them the management systems had to change, which also resulted in a change in military thinking. One of the most significant events of these thirty years has been the accession to NATO.

High demands and new challenges have become a constant part of everyday life. International presence and commitments to missions provided soldiers with an opportunity to gain insight into the operation, organizational structure, and command system of other forces. Operating as a part of multi-national contingents required more than just getting to know the other nations' armed forces. Common principles had to be applied and used and an understanding of each other had to be developed during the operations to such depths as to enable us to accomplish the operational target through joint effort.

When we think of the military, the soldiers serving in it, the technical equipment, the order of procedure, or even its structure will always be part of it. However, what is the main driving force behind this huge organization? Soldiers who contribute the best of their professional skills to everyday tasks, who perform beyond their strength to move resources necessary to achieve organizational objectives, and assume responsibility for carrying out specific tasks. They lead the soldiers entrusted to them, both at home and abroad. These soldiers are the military leaders for whom the last thirty years have been the most burdensome. They had to adapt to all the changes, which required them to constantly learn and change their thinking and behaviour. The radical change in leadership thinking became more and more rapid with the passage of time. Those who could not or did not want to follow this fell out of the system, thus becoming unfit to be a leader in the face of the challenges of the age. Organizational and leadership culture is a determining and influencing factor in the development of leadership thinking.

The aim of my research is to examine the new challenges of troop peacekeeping at the unit and subunit level in the twenty years of joining NATO and in the ongoing ZRINYI 2026 Defence and Force Development Programme. The last twenty years and current transformations give topicality to the research topic I have chosen. In this article, I examine the culture of military leadership. My research method was to gather primary sources, gather background material, conduct empirical studies and comparisons, and review available studies.

1 SHORT HISTORIC OVERVIEW

If we come to think that we recently commemorated the 170th anniversary of the Hungarian Defense Forces, it becomes clear how long a time it is in the life of the military. How many wars, how many revolutions, how many changes, all of which, as influencing factors, had a serious impact not only on the life of the military but also on the life of civil society. In the era of the Austro - Hungarian Empire, traces of the Prussian leadership culture were already present in Hungarian military thinking, which was the cradle of the mission-oriented leadership. (Czegledi,2015)

Until the end of World War II, its presence could be felt in Hungarian military leadership thinking, especially in the Horthy period, but after World War II, due to the presence of Russian influence, the leadership of the mass military began to be incorporated into Hungarian military leadership. During this period, the Ludovika Academy played a major role in the training, education and preparation of military leaders. (Siposné Kecskeméthy – Kalavszky, 2018, p. 359). The Russian influence was special because its traditions also stem from the Prussian culture, but in a uniquely interpreted and supplemented version of it. Subsequently, leaving the Warsaw Pact meant a new beginning that started with the participation of the Hungarian Defense Forces in peace support operations. (Szenes - Kecskeméthy, 2019, p. 487).

A little later, NATO membership meant a major change due to the emergence of new, very high standards. The notion of mass army disappeared; compulsory military service has been completely replaced by voluntary service. The development of the force has been quite varied since the opening. There were very difficult times, others that were increasingly perceived as retrogression, in some cases everybody lived through periods of firefighting. With the advent of new equipment, contribution in growing strengths to a number of international missions and the associated responsibilities, recognition also began to grow at the

international level. The ongoing modernization process, which affects all areas, is more than a milestone in the 170-year history of the Hungarian Defense Forces. (Kecskeméthy, 2018, p. 357). It is a point which our predecessors expected all their lives, an opportunity which results in a very modern military force that is well structured and has good leadership. And, as I wrote earlier, the driving force of this whole process lies in the military leader's activities.

2 THE RELATIONSHIP BETWEEN LEADERSHIP CULTURE AND ORGANIZATIONAL CULTURE

It is very difficult to find any study or scientific research to define the concept of leadership culture, and even if someone mentions the definition in any study, they are only dealt with tangentially at most. If we interpret the few mentions, many may simply think that leadership culture is the projection of organizational culture at leadership level. I, however, think that this cannot be treated as exact facts. In my article, I am the first to try to define the concept of leadership culture, interpret its components and define the types that are present in the Hungarian Defense Forces.

The concept of organizational culture has been defined in many different ways, which vary from one study to another, and their empirical results are always controversial. The keywords or word combinations of the concept also change, but maybe there is a couple of them that can be found in all of them: values, convictions, beliefs and the sum of all of these adopted and interpreted together by all members of the organization. Obviously, the wordings vary by type of organization and will assume characteristics typical of the organization. These are the reasons why accurate phrasing of the definition is difficult. (Málovics, 2015).

Organizational culture was examined by Geert Hofstede, a Dutch cultural researcher whose scientific findings include the definition of the five dimensions of organizational culture, the ideal types of organizational culture, and the cornerstones of organizational culture. *"Geert Hofstede defines culture as the collective programming of thinking that is unique to a group or a certain category, and includes the common characteristics that influence our responses to changes in the environment. Culture is all that people do, think, and have as members of society."* (Török, 2012, p. 7).

Regarding leadership, he says: In leadership, leadership and organizational theories cannot be exported in the life of an organization without considering the cultural context. (Török, 2012). Based on this statement I look at military leadership culture, in relation to its peculiarities and components. Geert Hofstede died in 2020. His academic achievements have often been criticized in recent decades, and there have been many who consider them to be erroneous, but the cornerstones he laid down in his research of organizational culture can only be regarded as successes and building blocks. (Hofstede, 2008).

The person who ensures and validates the continuity of the organizational culture is the leader in the life of the organizations. The leader is a person who has his own way of thinking, experience and emotions, all of which is necessary to define the concept of leadership culture. For this reason, it is also important to examine the definition of leadership culture. The leader can always be examined from many angles. His or her activities can be studied based on his or her leadership style or even on the leadership role assumed. Examining and defining a leader's leadership culture is a very complex process. While the leadership style is used by the leader to carry out a task or chooses a leadership role to fill a position choosing or adopting, or adapting to, a leadership culture is not so

clear-cut activity which can be either conscious or subconscious. The individuality of the organization, its historical traditions, the composition of its employees, the organizational goals and the values interpreted and accepted must be taken into account. While the leadership style or the chosen leadership role can be changed, leadership culture is very difficult to change, not to mention the fact that change takes a long time. The leadership culture includes organizational culture, as it affects the leader inside the organization, therefore the leaders cannot free themselves from it.

In the military, organizational culture has a very strong presence. It has an impact on the lives of the subunits and thus on those who serve in them. It is multi-layered and can vary from one subunit to the next. Consider that the eponym of a subunit was chosen with good reason as his/her heroic actions or possible connection to the subunit can be historically proven. However, it also happens that a sub-unit within a unit, chooses to be named after another iconic person. For example, in the case of the Vitez Sandor Szurmay Budapest Garrison Brigade, the 32nd Home Defense Ceremonial Unit within the Brigade, as a regiment level organization, is the legal successor of the 32nd Infantry Regiment, preserving and passing on the mentality and organizational culture of the Infantry Regiment founded by Empress Maria Theresa.

The names and the battle order numbers that come before the designations of the military organizations all demonstrate how important organizational culture based on traditions and values is in the life of a military unit. This mentality has a great influence on military leaders who command the military organization. It is also possible to examine and look for the phenomenon of leadership culture from another perspective. The “service branch chauvinism” within of the army is a phenomenon known to everyone in the armed forces. The simplest way of approaching this concept is the sentiment of pride and partiality as the strongest symbol of adherence to a specific unit or corps. Think of armoured, infantry, reconnaissance, artillery or even logistics personnel. Belonging to each of the service branches forms a strong bond within the military organization. This may as well be called service branch culture, whose peculiarity and strength lies in the military equipment available, the tactical procedures used, the type and rigorousness of training requirements, or what special skills are typical of the service branch that the soldiers must master. This special service branch culture is fixed in the early stages of the socialization of belonging to a service branch, thanks to the above. Putting it into practice and maintaining it is, again, up to the leaders.

This could be examined from a great many angles (even based on the type of contribution to the operational mission), but whichever aspect you bring it to the foreground, as I wrote earlier, one thing is certainly true - the leaders have the greatest role, task and responsibility in developing, maintaining cherishing or even modernizing it. Without it, this process is unthinkable.

3 COMPONENTS OF THE LEADERSHIP CULTURE

Leadership culture is a very complex phenomenon. Based on my 20 years of military leadership experience, I boldly state that it follows from its complexity that many things need to be considered in determining it. Both; internal and external factors.

Internal factors:

- organizational culture
- organizational profile
- organizational goals
- higher command objectives
- leadership style
- leadership role
- leader's personality
- composition of subordinate personnel

External factors:

- social judgement
- role in society

Military leaders, as soldiers, are affected by both factors. As members of society, they have their own independent thoughts and views. They are also affected by these common or different social approaches or opinions, but as they are soldiers, the most influential factors for them are the set of rules and attitudes that are typical aspects of military life. (Farkas, 2010).

On the specialty of this, Huntington says: *„When people act in the same way for a long time, they usually develop characteristic and enduring thinking habits. Through their relationship with the world, which is unique to them, they look at the world only in a way that is unique to them, which leads them to find a reasonable explanation for their behaviour and role. This is especially true when the role is professional in nature. They pursue their profession in a more narrowly defined sense, more intensely and more exclusively and are more clearly isolated from other human activities than in most occupational fields."* (Huntington, 1994).

The complex set of tasks, expectations and influences that military leaders are affected by is well reflected in his words. Leadership culture is perhaps one of the most elusive phenomena which cannot be described in one single definition and anyone who tried to do it would probably add something to it or take something from it that would equally make sense. What is a fact that can be clearly described is that it exists and influences the leader, shapes the organization, nurtures and protects values, and creates new ones.

4 THE RELATIONSHIP BETWEEN LEADERSHIP THINKING AND LEADERSHIP CULTURE

Military leadership thinking has been changed over the past decades, but in fact over the past century, by the same characteristic influences. (Sun Tzu, 2011, p.58). Test results of new combat equipment, new combat tactics, new theatres of operations, new challenges and the appearance of these effects. For a long time, the ground rules were what von Clausewitz[1] (Forgács, 2017). wrote, during the application of which there was a military

[1] *"Politics always defines military operations - in the words of Clausewitz: War is the continuation of politics by other means only. So we see that war is not just a political act, but a real political tool, the continuation of political contact, its realization by other means."*

leader who sought the Hungarian character in addition to the Prussian principles. General Ferenc Szombathelyi was such a military leader, who said that less should be done politically than militarily to prepare for war. (Siposné Kecskeméthy - Kalavszky, 2018, p.359).

It was clearly demonstrable that the Hungarian soldier was not determined by his thinking, but by his actions in combat. (Kaló, 2010). After the quest for the Hungarian way, the presence of Russian influence in many ways changed military thinking, which even today can be found in the system. To prove this, suffice it to think of the conceptual level controversies in understanding "Commander" or "Military Leader." (Benkő, 2008). Following this, the American Military Leadership[2] principles were published that represented something radically different from the previous ones.

The people-centeredness and mission orientation of the military leadership were given the greatest role. Requirements emerged that are now unquestionable for a military leader, such as leading by example, authenticity or humaneness. The change and adaptation of leadership thinking leaves its mark on leadership culture. The effects of events recorded in history clearly and indisputably prove that the Hungarian military leaders have always been able to renew and their adaptability is one of their greatest virtues. Accession to NATO set examples for the leaders that completely changed the values and standards in the accomplishment of the missions. As leadership thinking evolved, so did leadership culture.

It adapted to the requirements of the times and it was formed with preserving those elements of the past that are values that can be passed on and that play a constructive role in the present. Based on the components of military leadership culture it can be said that one of the most decisive factors in the military leadership and the quality of leadership determines success. Its value and strength lie in how much the leader believes in it and how much he can convey it. While leadership thinking is a process aimed at problem solving and finding the most appropriate way in the system of tasks, leadership culture is a complex phenomenon that includes the values that the leader, together with his or her subordinates, creates or nurtures to achieve a goal of his or her own and the higher commander's intent.

5 THE EMERGENCE OF MILITARY LEADERSHIP CULTURE

The evolution of leadership culture emerges in military leaders as a result of many factors. The initial period of military socialization begins at the school desk or in basic training. It rests on the foundations of learning and experience. Later, the application and further development of the knowledge acquired is the breeding ground. The more external factors affect military leaders, the more diverse their leadership culture will be. The challenges, extreme situations, the effect of taking responsibility, the sensation of the unknown, the compulsion of standing their own ground all shape the culture. Positive and negative factors in the listed situations, such as experiencing success and failure, are one of the most important shaping forces.

A military leader is expected to have a systemic approach, think at least three levels up and down, plan for the long term, be able to change, be flexible, proactive, but rule-following, and always prioritize organizational goals over his or her own. Compliance with these is quite an

[2] FM 22-100, 2019: U.S. Armed Forces Leadership Doctrine, which includes the Military Leadership Concept. It was written in 1953 and was updated until 1999. The leadership doctrine containing current concepts in the U.S. military is ADP 6-22.

expectation in itself, but the result of this journey is the development of a specific leadership culture. What leadership style a leader chooses or what leadership roles he or she is able to assume is all attributable to this process, and results in the evolution of the leadership culture. Organizational culture is another influencing factor in the development of individual culture. Every soldier subconsciously and consciously adapts to the military unit where he or she serves. They pick up the peculiarities of organizational culture and identify with them after a while. This effect prevails on military leaders more forcefully. It shapes and forms their own opinions, convictions, way of thinking, but a situation may arise, when it pulls them back.

Of course, there are also circumstances where the military leaders can with great difficulty, or not at all, accept the organizational culture represented by the given organization. In this case, the leaders can do one of two things. They can try and shape themselves, approximate their own culture to that of the organization, because leaders who refuse to accept the operational concept of their own organization, cannot represent it either, thus they cannot convey it to their subordinates, and the efficiency indicators of the subunit led by them will fall short of the expectations.

6 TYPES OF MILITARY LEADERSHIP CULTURE

In 1986, Charles Handy created four types of organizational culture:

- power culture: power, influence and authority are mostly held in one hand and are centred around the individual leader. Leadership is determined by those in key positions. Individuals are evaluated based on their results. Decisions are made based on the balance of power.
- task culture: performance and its outcome are important here. Decision-making powers are shared and evaluation is always based on performance. Creativity and flexibility are also important.
- role culture: organizational roles are important components of it. The source of power is the position filled. Personal characteristics, ambitions, innovations, ideas do not matter. It is characterized by many job rules, bureaucratic order and rules of procedure.
- personality culture: people with great expertise establish an organization so power is only formally present, they are equal, decisions are made jointly, by consent, there is no leadership hierarchy. (Handy,1993).

Based on the culture types it can be clearly seen that there is not one typical among them that might completely be matched with the organizational culture of the Hungarian Defense Forces. Each of them has some features that can be integrated so the four types of military leadership cultures are present in a mixture, complemented by the peculiarities of the present.

Based on the above, in the development of leadership culture, because of the previously often mentioned complexity, the following military leadership culture models have emerged in my 20 years of military leadership experience:

- Dynamic

  The leader chooses his or her leadership style and role by communicating his or her own ideas to the subordinate personnel with managerial thinking, taking into account the

organizational culture and setting the most usable values by his or her side. The leader represents the need to be able to respond to all situations in the fastest and most professional way possible, at the same time making sure that organizational values are not compromised and the subunit led by him or her appears in the best light.

- Improving

  A leadership culture that is typical of young or immature leaders who are capable of improving. A typical feature of this leadership culture is the quest for the way of adaptation to the existing organizational culture. The leader's own leadership culture is under the evolution and it is adapting to organizational values and organizational goals.

- Casual

  Keeping their own individuality, taking into account the organizational goals leaders shapes the command of a subunit by accepting the organizational culture, they are able to identify with it and convey it to the subordinate personnel, but refuse to spend more energy on it. The practical reflection of this is that the tasks are completed on time, but he has no constructive ideas, thus not contributing to the development of the organizational culture.

- Well organized

  Leaders do everything they can to make sure organizational goals and values represented by the organization are never compromised. Their leadership culture is characterized by the organization's full support and subordination to it, thus ensuring in practice that tasks are fully planned and implemented at the subunit level. This ensures that the organizational culture of the unit and subunit is maintained.

- Problem solving

  A unique leadership culture in which the leader favours those abilities both within himself and his subordinates that helps the organization to respond as effectively as possible to all situations, missions and problems. It has a constructive effect on the organizational culture, as a result of which many solutions are developed for a given situation, which can even lead to the development of new procedures, and as a result, other organizational elements can work better and more effectively. In this way, the organizational goals that nurture and build the organizational culture are better achieved.

- Resistant

  The leaders completely deny and refuse to accept the peculiarities of organizational culture, they are therefore unable to adapt to it, so the culture they convey has a completely negative effect on those they lead, which in turn affects the achievement of organizational and managerial goals.

The development of a leadership culture in a leader's personality depends on what type of leadership styles and leadership roles he or she prefers and what personality traits they associate with, as well as the strength of the organizational culture's presence and the values that the organization prefers in the subordinate personnel.

CONCLUSION

In my article I attempted to define the concept of military leadership culture based on my own leadership experience, to interpret its components and to define the types that are present in the Hungarian Defence Forces. Organizational culture and leadership culture are in a very close interrelationship. Organizational culture includes the values, traditions, convictions and common objectives of a complete system and the leaders draw on their own personality, abilities, adapting to the reflection of the organizational culture on the individual level. It can be seen that they mutually affect each other because the leader conveys organizational culture, so it is brought to bear indirectly through the leader.

It is important that the leader should believe in it, because only in that case can he credibly convey the values that are important in keeping the organizational culture, and thereby the leader can contribute to further developing those values. The evolution of leadership culture in a leader is a lengthy process and the goal is to raise it to an appropriate, effective level. Maturity is the key to the leader being able to consciously communicate common values. This is based on a good leadership culture. The leaders should believe in what they stand for or what they convey, because the only way to be able to support the organization in its everyday progress towards achieving its goals. The practical appearance of the leadership culture employed before the subordinate personnel ensures the quality of conveying for the leader.

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THE ROLE OF THE US-ROK ALLIANCE IN THE NATO-ROK GLOBAL PARTNERSHIP

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ABSTRACT

NATO's attention was directed to "enlargement" and "tight connection" with Global Partnership countries as prime agenda. In this context, the main objective of this paper is to find the cause of "a loose connection" between NATO and ROK by analyzing the geopolitical concern in NEA and comparing the US-ROK alliance. Besides, we will forecast the NATO-ROK partnership through 1) an exclusive interview with Major Hwang from Korean Army, currently working at NATO, which was conducted by Mo Rang KIM, 2) interviews with twenty Korean elites, and 3) a conversation with the Director of Security Policy and Partnerships at NATO. Judging from the study, it is highly probable that 1) the US-ROK alliance would cooperate in military security, 2) NATO-ROK Partnership would cover non-traditional security.

KEYWORDS

NATO Global Partners, Republic of Korea, US-ROK alliance, wartime operational control (OPCON) authority, Asia Pacific security, geopolitical concern, Quad, non-traditional security

INTRODUCTION

NATO has gradually expanded its member states by overcoming geographic limitations. Furthermore, it has also transformed itself into "a global organization" rather than simply "a regional organization" through its partnership. Since 2005, the relationship between Korea and NATO has been 16 years. So far, very little research has been done in dealing with South Korea's position regarding NATO-ROK relations, and it is because that there has not been much progress in the relationship with NATO yet.

In this context, this research used two main methods to overcome the lack of studies in the NATO-ROK Global partnership and determine whether the US-ROK alliance is an obstacle or catalyst for the past and the future NATO-ROK Global Partnership. First, this research compared NATO and the US-ROK alliance. Through the comparison, this paper analyzed what type of alliance they have maintained (bilateral or multilateral alliance), when they signed (cold war era or post-cold war era), what current situation is (ceasefire or peacetime), who led forces (US or ROK or member states), how to make decisions (by consensus or unanimity) who guided forces (Military Committee or Military Committee),

who the leader is, what the component command is (Ground, Air, Sea), who the supreme commander is and what authority of supreme commander is. These categorized comparisons answered whether the US-ROK alliance would replace the NATO role in the Republic of Korea or not and how to identify NATO-ROK's future cooperation by considering wartime OPCON transition.

Second, through 1) an exclusive interview with Major Hwang from Korean Army, currently working at NATO, which was conducted by Mo Rang KIM, 2) interviews with twenty Korean elite representatives from political, academic, and military filed; and 3) a conversation with the Director of Security Policy and Partnerships at NATO, this paper forecasted what the possible NATO-ROK cooperation is. It focused much attention on whether the future NATO-ROK is possible in the field of traditional security or non-traditional security cooperation. Especially an exclusive interview with Major Hwang would contribute to further research. It is pretty reasonable that Major Hwang's current duty, mission, and aims to be dispatched to NATO would hint at the future NATO-ROK cooperation.

Therefore, in the first chapter, this article will analyze the obstacle of NATO-ROK relations in the aspect of geopolitical concerns. It will show how unstable geopolitical features led to an accelerating arms race with bilateral alliances in Northeast Asia instead of establishing an Asian-way NATO by defining North East Asia Region and how this will affect NATO-ROK relations. The second chapter will compare the NATO and US-ROK alliance. This comparison will answer why the NATO-ROK partnership maintains a loose connection by tracing the history of the NATO-ROK partnership since 2005. In the third chapter, how the wartime operational control authority brought the symbolic signs of rapid development between the NATO-ROK partnerships. Lastly, the fourth chapter will explore the future outlook on the NATO-ROK relationship and the US-ROK alliance.

1 GEOPOLITICAL CIRCUMSTANCE OF THE REPUBLIC OF KOREA

It may be necessary to start by defining the Northeast Asia (NEA) region to understand the unique geopolitical characteristics of the Korean Peninsula and how those features affect the relations between NATO and the Republic of Korea.

There are varied definitions of Northeast Asia; therefore, it would not be an overstatement to say that there is "the lack of an agreed definition" in the NEA region. To put it differently, the range of the Northeast Asian area is not fixed but is determined by context. Generally, it refers to three countries, Korea, China, and Japan, in a narrow sense. However, the term "Northeast Asia" was originally introduced by American historian and scientist Robert Kerner in the 1930s. He defined the Northeast Asia region by including the Korean Peninsula, the Manchurian Plain, the Mongolian Plateau, and the mountainous regions of Eastern Siberia, stretching from Lake Baikal to the Pacific Ocean. (Kerner, 1939; Li & Cribb, 2014) Seen from the United Nations ESCAP, they recognize China, the Democratic People's Republic of Korea, Japan, Mongolia, the Republic of Korea, and the Russian Federation as NEA countries. (UN ESCAP, 2021) Similarly, according to the Economic Research Institute for Northeast Asia (1999), Russia, Mongolia, Japan, Korea, and China are also accepted as NEA areas.

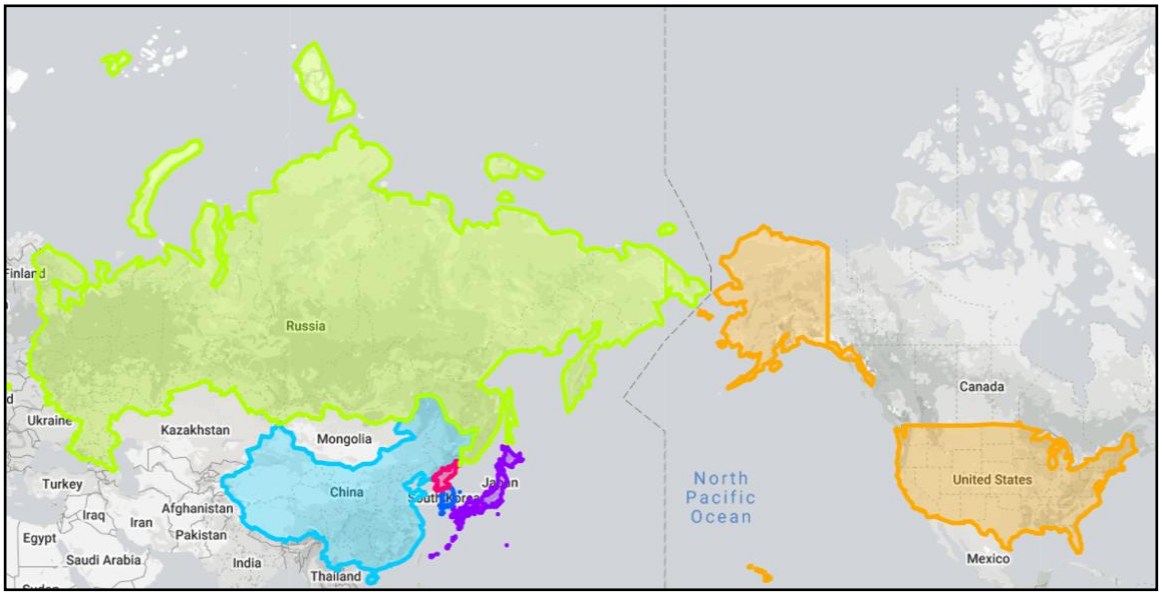


Figure 1 Northeast Asia region by geopolitical definition

Source: http://thetruesize.com. (Edited by Morang KIM)

In other words, geographically, China, Japan, North Korea, and South Korea can be considered Northeast Asia region. However, politically, it is generally taken for granted that Russia and the US are also NEA regions. This paper shall not polemicize here on whether Russia is in the European or NEA region but introduce the definition of the region by Hemmer and Katzenstein (2002). As they understand, regions are not fixed naturally and inalterably by "geographical features," but it is the "product of political construction." Thus, political creation decides what country belongs to a region. Viewed in this light, it would be reasonable to say Northeast Asia is composed of China, North Korea, Russia, Japan, South Korea, and the United States.

These six countries are global economic and military powers and are located where communist and democratic systems coexist.

According to the 2020 GDP estimates analyzed by the IMF (2020), the United States ranked first, and China, Japan, and Korea respectively ranked second, third, and tenth. In other words, four out of six countries in Northeast Asia ranked in the top 10 in GDP. It is logical for economically powerful countries to increase national defense expenditures, especially if there is no regional economic/security organization based on mutual trust in their region. In connection with this, the security dilemma is widespread in the NEA region by intensifying the arms race. Global Firepower's research gives a convincing example. In the 2021 World Military Strength Rankings, five of the six countries in Northeast Asia were ranked in the top six. The United States, Russia, China, Japan, and South Korea respectively ranked first, second, third, fifth, and sixth. Although North Korea was not in the top ten but ranked 28th, they have already implemented a strategy to negotiate favorable terms with the United States as "a nuclear-weapon state."

Table 1 2020 GDP (Nominal) Ranking

1	United States
2	China
3	Japan
4	Germany
5	France
6	United Kingdom
7	India
8	Italy
9	Canada
10	Republic of Korea

Source: IMF, 2020

Table 2 2021 Military Strength Ranking

1	United States
2	Russia
3	China
4	India
5	Japan
6	Republic of Korea
7	France
8	United Kingdom
9	Brazil
10	Pakistan

Source: GFP, 2021

Created by Mo Rang KIM

From the above, one could logically assume that economic capabilities do not always guarantee military power. According to the 2020 GDP Ranking, Germany, France, United Kingdom, Italy, and Canada, which are all NATO members, have higher economic capabilities than South Korea and Russia. Then why do South Korea and Russia have higher military strength than those five NATO members? It is reasonably related to the geopolitical factor which led to the absence of multilateral cooperation. Because ironically, the distrust among NEA countries, which is based on geopolitical characteristics, built up the military power in their region. More precisely, communist countries (past Russia, China, North Korea) and democratic countries (USA, Japan, South Korea) in this region have been sharply opposed and distrusted each other.

In a nutshell, unstable geopolitical features led to an accelerating arms race with bilateral alliances in Northeast Asia instead of establishing an Asian-way NATO. Significantly, South Korea, surrounded by military/economic powers such as North Korea, Japan, China, and Russia, has experienced a vicious circle of the arms race after the Korean war. As a result, there is no agreed regional economic and security cooperation organization due to mutual distrust in the region such as the EU, NATO, or ASEAN in the NEA area. Instead, there are solid bilateral alliances between ROK and the US.

Proceeding from what has been said above, it is not hard to guess that these geopolitical circumstances also affected the NATO-ROK relationship. The relations between NATO-ROK partners cannot only be explained with natural geographical features. However, the relations should be analyzed in the aspects of geopolitics, which is the "product of political construction." Therefore, the absence of multilateral cooperation resulted in the growing call for multilateral defense cooperation in the Indo-Asia-Pacific. According to Burgess and Beilstein (2018), the reason for the necessity of multilateral cooperation is China's territorial expansionism and North Korea's nuclear threat.

Under this circumstance, it may be a massive opportunity for the Republic of Korea to expand its security scope to a partnership with NATO rather than simply being satisfied with the bilateral alliance with the US. Thus, the next chapter will review the history of the NATO-ROK relationship and analyze the current cooperation between South Korea and NATO.

2 HISTORY OF NATO-ROK PARTNERSHIP

The history of the NATO-Republic of Korea partnership dates back to 2005 when Ban Ki-moon, then Minister of Foreign Affairs of the Republic of Korea and former UN Secretary-General, visited NATO headquarters. During his speech to the North Atlantic Council (NAC), the position of South Korea, which is looking forward to cooperation with NATO, was delivered. This was the starting point of the NATO-ROK relationship.

2.1 Building and Institutionalizing Partnership

A year later, at the 2006 Riga Summit, NATO announced its plan to develop relations with potential contributors, referred to as "Contract Countries," to NATO operation. The Republic of Korea has been designated as a contact country with Japan, Australia, and New Zealand. Of particular significance in this decision is that Contact Countries can access any activities offered under NATO's structured partnerships. (NATO, 2009)

Since the 2008 Bucharest summit, Contract Countries have been referred to as "Partners across the globe" or simply "global partners." NATO also discussed strengthening cooperation with Partners across the globe. As part of that, NATO negotiated TCPs (Tailored Cooperation Packages) with Australia, New Zealand, Japan, and the Republic of Korea. TCPs are similar to what NATO has provided to the Mediterranean Dialogue and Istanbul Cooperation Initiative States. It is cooperative activities tailored to individual countries based on NATO's priorities and the specific interests of partner countries. Moreover, the NATO-Republic of Korea regular meeting has provided great opportunities to strengthen mutual understanding and share strategic interests.

In 2009 the Republic of Korea signed an MOU between Korea and NATO on information security. It must be admitted that the Republic of Korea can be allowed to access the information NATO provides to its member states. In particular, NATO and the Republic of Korea share information related to the activities of the International Security Assistance Forces dispatched to Afghanistan, including the Afghanistan war. In other words, it is a procedure for NATO to approve the dispatch of ROK troops to Afghanistan and has the meaning of completing the preparation for dispatch internationally. (KBS WORLD, 2009)

Furthermore, the Republic of Korea and NATO agreed on an Individual Partnership and Cooperation Programme (IPCP) in 2012 and was renewed in 2017 and 2019. Such a regular renewal system for partners contributes to developing cooperation on mutual interest matters. Generally, the goal of IPCP is to interact and cooperate effectively in various areas by following the detailed road map. After signing IPCP, the Republic of Korea has participated in the Interoperability Platform with 24 partners. (NATO, 2021; Embassy of the Republic of Korea to the Kingdom of Belgium and the European Union, 2018)

2.2 ROK's Support

From 2010 to 2013, the Republic of Korea has supported NATO-led missions and operations in Afghanistan for international peace and stability with NATO partners. South Korea established the Korean Provincial Reconstruction Team (PRT) to help them stabilize the provincial government's capacity, restore peace and pursue social and economic development. PRT supported them for their health, education, rural development, and governance. In 2012,

the Afghan government took over PRT from the ROK. Finally, South Korea withdrew the Ashena unit due to the completion of the PRT mission in 2014. (NATO, 2021; Ministry of Foreign Affairs of Republic of Korea, 2014)

Table 3 History of NATO-ROK Partnership

Year	Major Events	Place
2005	Ban Ki-moon, then Minister of Foreign Affairs of the Republic of Korea and former UN Secretary-General, visited NATO headquarters and gave a speech to the North Atlantic Council	NATO HQ, Brussels, Belgium
2006	At Riga Summit, The Republic of Korea has been designated as a Contact Country along with Japan, Australia, and Newzealand	Riga, Latvia
2008	Contract Countries were referred to as "Partners across the globe" NATO negotiated TCPs (Tailored Cooperation Packages) with Australia, New Zealand, Japan, and the Republic of Korea.	Bucharest, Romania
2009	MOU between Korea and NATO on information security	NATO HQ, Brussels, Belgium
2010	Korea and NATO Signed the ISAF Participation and Financing Agreements ROK established the Korean Provincial Reconstruction Team(PRT)	Brussels, Belgium/ Afghanistan
2012	ROK signed the first Individual Partnership Cooperation Programme (IPCP)	NATO HQ, Brussels, Belgium
2014	ROK withdrew the Ashena unit due to the completion of the PRT mission	Afghanistan
2020	ROK joined a NATO Foreign Ministers Meeting for the first time	NATO HQ, Brussels, Belgium

Source: NATO, 2021. Created by Mo Rang KIM

Beyond NATO-ROK's operation in Afghanistan, South Korea supported them financially as well. ROK contributed USD 755 million from 2011 to 2020 to the NATO-run Afghan National Army (ANA) Trust Fund. In 2020, ROK took the ANA Trust Fund's co-chair. (NATO, 2021)

Another cooperation between NATO and ROK is counter-piracy operations in the Gulf of Aden. Moreover, merchant vessels that pass through the Horn of Africa are escorted by the ROK navy. (NATO, 2021)

2.3 NATO-ROK Individual Partnership and Cooperation Programme

The Individual Partnership and Cooperation Programme (IPCP) is a document that defines the framework of cooperation between NATO and partner countries and is not legally binding and is renewed every two years. (Ministry of Foreign Affairs of Republic of Korea, 2014)

The goal of cooperation between NATO and ROK is to promote interoperability; create opportunities for technology and science exchange; and cultivate competency through the exchange of education and training. (Ministry of Foreign Affairs of Republic of Korea, 2014)

Priority Cooperation Sectors with NATO seem more related to non-traditional security. It includes cyber defense; countering terrorism; energy security; Science for Peace and Security (SPS) program; consultation, command, and control; deployment, maneuver; defense research and technology; arms control, disarmament, Non-proliferation; defense policy and strategy. (Ministry of Foreign Affairs of Republic of Korea, 2014)

As we have seen, the non-traditional security cooperation between ROK and NATO has been more prominent than traditional military security since 2005. Besides, the 16-year cooperation was somewhat formal, and Korea's passive attitude was shown. The cause can be found in the geopolitical factors of the Republic of Korea, as mentioned in the previous chapter. In the next chapter, this paper will compare NATO and the US-ROK alliance, which are very similar to NATO, and analyze how the US-ROK alliance affects the NATO-ROK partnership.

2.4 US-ROK Alliance

If NATO was so successful in Europe, why did the ROK not take an active attitude toward NATO as a global partner? Before going on with the question, it is necessary to compare US-ROK Alliance and NATO.

The US-ROK alliance has many similarities with NATO. It means the bilateral alliance also provides almost what NATO did for their member countries. Those similarities can be represented as shown in Table 4. Although NATO and the US-ROK alliance differ somewhat in form as the multilateral alliance and the bilateral alliance, most importantly, both alliances originated from the Cold War NATO. In other words, NATO opposed communism and maintained peace within Europe. In common with NATO, the US-ROK alliance stood against North Korean communism on the Korean peninsula and maintained the status quo on the Korean peninsula. (Park, 2020)

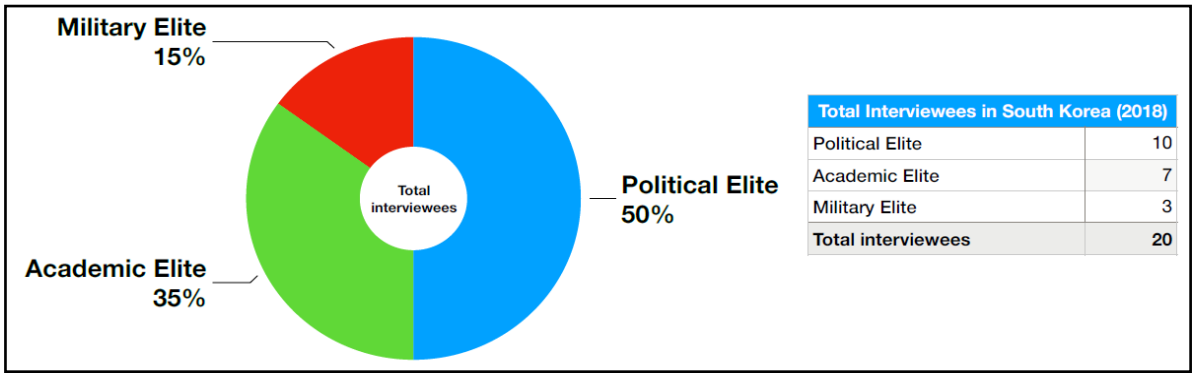
Table 4 Comparison of NATO and the US-ROK alliance

US-ROK Alliance	VS	NATO
Bilateral	Form of Alliance	Multilateral
1953	Sign	1949
Ceasefire	Condition	Peacetime
US	Forces led by	US
Consensus	Decision	Unanimity
Military Committee	guided by	Military Committee
Each Minister of National Defense / Leaders	Military Committee Follow Guidelines of	Each Minister of National Defense / Leaders
Ground, Air, Sea	Component Command	Ground, Air, Sea
US	Supreme Commander	US
Operational Control	Authority of Supreme Commander	Operational Command
Peacetime: ROK Force Wartime: US Force	Operating System	Peacetime: NRF (NATO Response Force)

Source: Park, 2020. Created by Mo Rang KIM

I would like to close the discussion on the comparison of NATO and the US-ROK alliance by answering the question at the beginning of this chapter. "If NATO was so successful in Europe, why did not the ROK take an active attitude toward NATO as a global partner?" The Republic of Korea pays scant attention to NATO because a strong US-ROK alliance which is very similar to NATO can provide much of what NATO can offer to its member states.

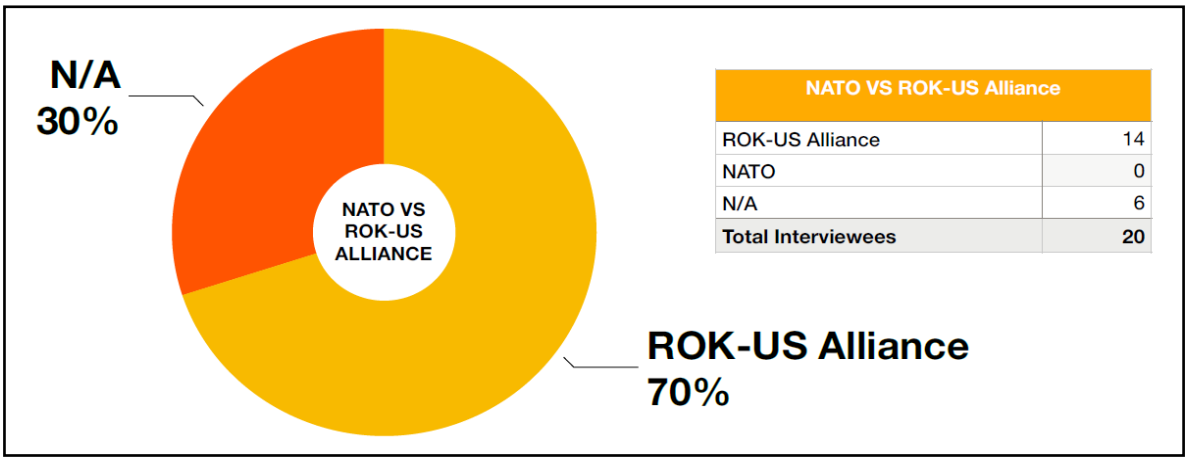
Interview which was conducted by Yoon et al. (2018) with ROK's high-profile elite representatives will offer further evidence that a robust ROK-US alliance may weaken the partnership with NATO. Twenty interviewees consist of three cohorts from political, academic, and military filed. (See Figure 2). Those three groups responded to whether the US-ROK relationship is more important than NATO-ROK relations in dealing with Korea's national security (See figure 2 below). It is no wonder that "no single elite representative" said the NATO-ROK relationship is more critical than the US-ROK alliance. In addition, how the US-ROK alliance influences the NATO-ROK partnership is repeatedly stressed by many elites. They mentioned that the NATO-ROK partnership could not be discussed without the US-ROK alliance. In other words, Korea still tends to view the NATO partnership as a subsidiary relationship to the ROK-US alliance.



Total Interviewees in South Korea (2018)	
Political Elite	10
Academic Elite	7
Military Elite	3
Total interviewees	20

Figure 2 Interview with Three Korean Eliet Groups

Source: Yoon et al., 2018. (Created by Mo Rang KIM)



NATO VS ROK-US Alliance	
ROK-US Alliance	14
NATO	0
N/A	6
Total Interviewees	20

Figure 3 Whether the ROK-US relationship is more important than ROK-NATO relations in dealing with Korea's national security

Source: Yoon et al., 2018. (Created by Morang KIM)

In the next chapter, I will try to show how the debate of the wartime operational control (WT-OPCON) authority between the US and the ROK has developed the most recent NATO-ROK relations.

3 THE WARTIME OPCON TRANSITION

As has been discussed in the previous chapter, it is clear that the robust US-ROK alliance brought stability and prosperity to the Korean Peninsula. Moreover, this 67-year-old relations between the US and the ROK led the NATO-ROK partnership to weaken relatively and maintain them as formal relations.

However, recently, there have been symbolic signs of rapid development between the NATO-ROK partnership. In what follows, I explore how the debate on the wartime operational control (WT-OPCON) authority between South Korea and the United States developed NATO Partnership.

As pointed out, Park (2020), the most significant difference between NATO and the US-ROK alliance is the process of alliance formation. Hwang (2020) also gave plausible explanations that The US-ROK alliance was formed “asymmetrically” from the beginning, characterized by “unilateral demands” and “unilateral contributions.” The US attempting a ceasefire responded to South Korea’s alliance demand to approve and control the South Korean government against the ceasefire.

Consequently, the initial asymmetrical and unilateral US-ROK alliance caused the operating system issues between the US and the ROK. Table 4 above also shows a fundamental difference between the US-ROK alliance and NATO in the operating system. In other words, NATO Response Force (NRF) operates during Wartime and Peacetime. However, the ROK military has taken over “peacetime operational control” from the US since 1994 (Ministry of the Interior and Safety, National Archives, 2006), also has been planning to take over WT-OPCON Authority from the US since 2006. (Hankyoreh news, 14 July, 2017)

Although the WT-OPCON was originally scheduled to transfer to the ROK government in 2012 and 2015, it was all postponed. (Hankyoreh news, 14 July, 2017) Besides, it was known that the WT-OPCON authority would be transferred to the ROK in 2022. (Air Force Magazine, March 18, 2021) However, at this New Year’s press conference, the Minister of National Defense of the ROK, Wook SEO, expressed a somewhat ambiguous position that “I will achieve the further result during my term” concerning the transition of wartime OPCON. (New Year’s Press Conference of the Minister of National Defense, 29 January, 2021) Namely, it is highly likely that the year for the transition of wartime OPCON will only be agreed with the United States within Moon Jae-in’s presidency. As we have seen, transferring the WT-OPCON to South Korea from the United States Forces Korea (USFK) has been discussed since 2006. In this overall perspective, one could say that it is unlikely to be feasible.

Nevertheless, South Korea has constantly attempted to take over the WT-OPCON Authority for “military sovereignty.” I shall not polemicize here whether it should be considered military sovereignty or not but will examine how the destabilizing element led the OPCON debate.

The WT-OPCON debate began in South Korea to minimize the security threats that occurred by changes in the US policies. For example, US forces in Korea have been steadily

decreasing with the peak of the Korean War (Hwang, 2020), and a policy to withdraw US troops in Korea was also promoted at certain times. (Han, 2012)

Thus, in this sense, it is no wonder that there is no basis for concluding that the US-ROK alliance will continue unconditionally. Also, the future of the US-ROK alliance cannot be predicted simply. Such signs of unstable US-ROK alliance change paradoxically have taken on renewed importance of the NATO-ROK partnerships.

On the 22nd of May 2021, US president, Joe Biden and the president of the Republic of Korea, Moon Jae-in, agreed to terminate the South Korea Ballistic Missile Range Guidelines that limited the country's missiles to 800 kilometers. (The Korea Herald, 22 May 2021) With the abolition of the guidelines, Korea has fully secured "missile sovereignty," and rocket technology can be used without restrictions on fuel (solid, liquid), range, warhead weight, and usage (military, civilian). It means the ROK could and would make significant changes in space security.

In this sense, the end of South Korea Ballistic Missile Range Guidelines has some hints, which might be interpreted as suggesting the possibility of the transition of the wartime OPCON authority. Therefore, even if the transition has low feasibility, Korea should be prepared for the worst by developing a relationship with NATO.

4 FUTURE OUTLOOK ON NATO-ROK RELATIONSHIP

There has been little research on the NATO-ROK partnership due to the solid US-ROK alliance, leading to the lack of interest in NATO. Therefore, this chapter will analyze the future of the ROK-NATO relations mainly through 1) an exclusive interview with a Korean Army, Major Hwang currently working at NATO, 2) interviews with twenty high profile elites which were conducted in 2018, and 3) a conversation with James Mackey (Director of Security Policy and Partnerships, NATO HQ) and Mark Tokola (Vice president, KEI).

PSP-officer Major Youn-Im Hwang from the Republic of Korea recently joined the NATO Standardization Office (NSO) and has worked in the Policy and Coordination Branch in the Section for Partner Coordination since March 2021. Officially she is the first Korean who is working for NATO, but unofficially the second one.

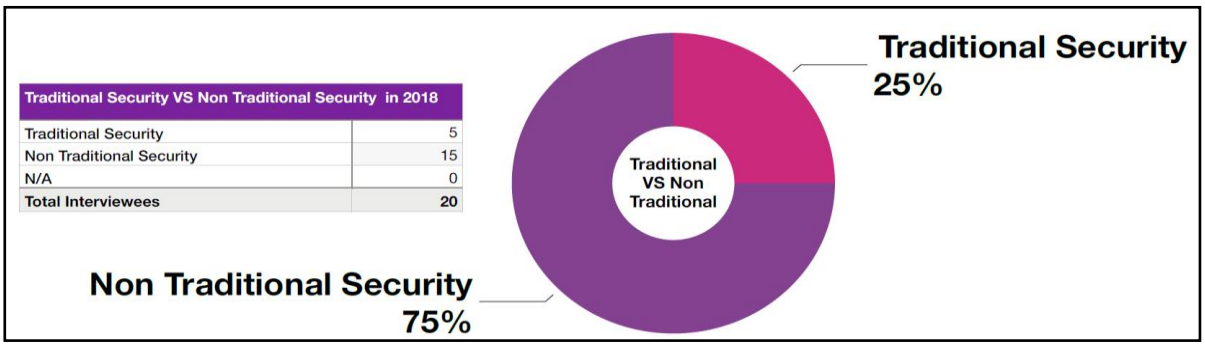


Figure 4 Whether ROK-NATO relations provides traditional or non-traditional security

Source: Yoon et al., 2018. (Created by Mo Rang KIM)

Major Hwang's position and duties at NATO could probably be an essential clue for predicting the future relationship between NATO and South Korea. Judging from Major Hwang's duty, it is natural enough that South Korea would expand the scope of standardization not only to "NATO alliances" but also to "partner countries" in the future. In addition, it should be noted that "I could not tell the details, but the ROK Ministry of Defense and the Joint Chiefs of Staff have a will to expand exchanges with NATO." (by Major Hwang) It can be a crucial clue to forecast the future of the NATO-ROK relationship.

According to Major Hwang (2021), "standardization" is an essential element for upgrading to a NATO Alliance, so countries wishing to become members must go through standardization. Besides, as non-traditional threats increase, the scope of standardization is expanding to partner countries.

Another interview showed that the cooperation between NATO and Korea would be remarkable in "non-traditional security." (See Figure 4) 15 experts out of 20 considered NATO-ROK cooperation mainly would be carried out in the field of non-traditional security.

According to James Mackey, Director of Security Policy and Partnerships at NATO, South Korea shares the same values and challenges that NATO members face.

"South Korea shares the values of the NATO member states. It is a liberal democracy. It is a member in good standing of the United Nations. It is an open society which is based largely on the same type of open economy, the liberal economy that we have..... we share some common security challenges, and that we are stronger when we work together on those shared challenges." (Korea Economic Institute of America, 28 April 2021, "South Korea's Partnership with NATO: Origins and Future Direction")

Mackey also regarded that the non-traditional security field such as cyber defense and disinformation would be more reasonable to cooperate for the NATO-ROK partnership.

"It is almost even easier than the traditional challenges..... it is not very cost-effective to send troops from Korea to Europe in order to train. But if we are talking about non-traditional challenges like cyber defense and disinformation. That is much more in the information space. So those are the area where we can certainly work very closely together. In fact, Korea has been involved actively in a number of NATO exercises that focus on cyber defense." (Korea Economic Institute of America, 28 April 2021, "South Korea's Partnership with NATO: Origins and Future Direction")

All this considered, it is hard to escape the conclusions of future outlook on NATO-ROK relationship that the US-ROK alliance would take a central role in the military security, and NATO-ROK Partnership would cover non-traditional security. This could be a relatively safe option for South Korea than Quad Plus, which is called "Asian NATO." Because participating in Quad Plus would not be able to avoid diplomatic conflicts with China and resultant economic losses. Furthermore, for South Korea, China is not only a merely neighboring country geographically but also the largest export/import partner economically.

Therefore, it is desirable for South Korea to establish friendly relations with other NATO members and partners while co-responding to non-traditional security issues as a NATO partner.

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SECURITY THEORY: SECURITY AS A MULTIDIMENSIONAL PHENOMENON

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ABSTRACT

People have been developing and continue to make enormous efforts, energy, and resources to ensure their safety since the beginning of their existence. The security and existence of people have been interconnected since time immemorial, and the history of mankind is, to a certain extent, also the history of the struggle for its security. That is also why the term security is one of those terms that we encounter almost daily and that we use very often throughout our lives. The term itself has several different meanings and dimensions, and with the development and ongoing changes in human society it is constantly gaining new ones. This is proof not only of the fact that the development of the security agenda is in constant progress, especially in the first two decades of the 21st century, but also that the approach of politicians, political scientists, academics, soldiers, security, and other experts to security is many times very different. Based on the above, the primary goal of the author, using relevant scientific methods within interdisciplinary research, is to contribute to the development of security science and expand the theoretical and perceptual basis of security and offer readers from the professional and lay public the opportunity to get acquainted with relevant theoretical sources and approaches to researching individual dimensions of security.

KEYWORDS

security, state, society, security science, security dimensions

INTRODUCTION

The current turbulent developing world brings many positive, but also negative phenomena, processes, events that manifest themselves in various areas of human life as an individual and human society as a whole. This is evidenced by the existing and ubiquitous threats and risks that rightly prioritize security issues. Security is a basic and necessary condition for the development of any society. It can be stated that there is no area of social life that is not connected with it. Currently, therefore, security is one of the most frequent and most inflected concepts in all its forms. This is one of the reasons why solving security

problems is now part of management processes at all levels and in all areas of society. However, the acceptance of the security field as an integral part of social life still encounters problems that raise a number of questions, opinions and a wide-ranging discussion on the theoretical and methodological aspects of understanding security. Security research thus develops in several directions and ways.

Reflections and the search for an answer to the question of what security is have accompanied humanity throughout its existence. Security is one of the most strongly felt human needs (Belan, 2016, p. 31) and initially, people associated security mainly with these two aspects:

a) security as protection against natural hazards which represented natural elements, disasters, calamities and their consequences, wildlife, etc. People considered this factor to be something quite natural that belonged to their world. Their existence or non-existence depended mainly on whether they would have sufficient natural livelihoods and whether they could resist natural hazards, resp. eliminates natural threats.

b) security linked to social threats. Gradually, as humans began to associate, new dangers and threats began to emerge, caused by man himself, that is, a creature of the same species. One had to start defending oneself against another person and many times even to fight for life and death for one's abode, hunting grounds, pastures, fields, territory.

A person with the acquisition and accumulation of property, when he becomes its owner, must devote part of his forces and resources to its protection. With the ownership of property, there are inequalities and differences between people, which, according to Hofreiter (2006, p. 11), provokes less wealthy or poor, who would also like to own some property, respectively. they would like to own it in a larger quantity, volume, or area. One becomes aware of the threats posed by other people and is forced to take measures to ensure one's safety and to protect one's property. However, his efforts to ensure his safety and to protect his property become counterproductive. By trying to achieve a higher level of security and increasing one's potential, the man-owner of the property provokes others with his growing power and thus becomes a threat to his surroundings. Others, feeling the threat from such a person, try to achieve a higher level of security and also increase their strength potential. The continuation of this counterproductive process in the form of militarization and feverish armaments and its consequences in the form of many tragic conflicts are known to humanity, according to Kazansky (2011), not only from ancient, but not so ancient history.

Despite the above-mentioned efforts of people to ensure their security and protect their property, security was mainly associated with life without wars. The horrors of war have, in human history, very often entered people's lives, bringing fear and sacrifice, causing suffering, hunger, disease and epidemics. Therefore, efforts to ensure peace have been linked mainly to ensuring security. Also, at a time of bipolar division of the world and the threat of a possible apocalypse as a result of a rocket-nuclear war between two antagonistic military-political groupings, the issue of security was associated mainly with efforts to prevent the outbreak of a devastating military conflict between the two superpowers and their allies.

However, following the easing of tensions in post-Cold War international relations, under the influence of deepening globalization and insufficient solutions to global human problems, the security environment is constantly deteriorating, and tensions and deteriorating relations between states are increasing. As a result of globalization, stability and security are changing.

Globalization is a highly dynamic multilateral process in which political, economic, social, security, military-strategic, technological, environmental, cultural, and other factors intersect and influence each other. At the same time, the development of globalization so far shows that economic factors have a decisive influence on its course, which significantly influences other factors. Based on them, a new system of not only international economic, political, and social relations, but also security relations are being created (Ivančík, 2011, p. 46). At the same time, political globalization is taking place as the importance of international bodies and organizations, exercising jurisdiction in the international arena, grows.

The deepening of economic, political, social and security activities across national borders because of growing globalization processes brings, together with the growing interconnectedness of individual actors in these processes, the acceleration and intensification of multilateral cooperation at the transnational level. However, strong internationalization, together with the weakening of temporal and spatial barriers, brings with it, in addition to many positives, also many negatives. These are reflected in new, especially non-military, asymmetric security threats, such as international terrorism, cross-border organized crime, illegal mass migration, the spread of religious and ethnic extremism, cyber attacks on public and private computer networks and systems, foreign intelligence activities or threats. in the possibility of using certain weapons of mass destruction.

Today, security is no longer associated only with military, but increasingly also with non-military threats. In addition, security is increasingly taking on a social dimension, following the aforementioned failure to address global problems of mankind. Therefore, in the context of security, growing inequalities, rising unemployment, poverty, crime, overcrowding in certain agglomerations and regions, uncontrolled mass illegal migration, stagnation, decline, corruption, and the failure to solve socio-economic and many other issues need to be addressed.

Unlike in the past, humanity is currently more affected by risks and threats such as unstable political regimes, failing states and insecure borders that allow not only illegal migration but also trade in human organs, smuggling of weapons, drugs and various goods. and religious conflicts, lack of resources and widespread crime. In this calculation, the solution of serious problems of devastation and degradation of the environment, depletion of resources, industrial and natural disasters, epidemics, pandemics, etc. cannot be omitted. In addition, without a deliberate attempt to exaggerate, it can be stated that some current manifestations of human behaviour and action in several spheres of society threaten the very existence and development of man as a biological species.

According to Homer-Dixon (2006), one of the serious problems of today's world, which has a significant impact on security, is also the fact that due to the rapid quantitative growth of interconnections of individual subsystems of human society, there is such a close connection and interconnectedness between them of a process in one subsystem will cause problems or shocks throughout the system. Another problem is that in today's world it is almost impossible to draw the exact line between external and internal security, as the removal of administrative and political barriers between states has allowed not only the free movement of people, money, and goods but also, unfortunately, the creation of better conditions for increasing illegal activities of terrorist groups or groups of organized crime. And since even natural disasters, industrial accidents or contagious diseases do not respect national borders, no country is isolated from these negative phenomena due to deepening globalization, even though their resources are very far away (Hofreiter, 2006, p. 55).

For these reasons, security cannot therefore be guaranteed absolutely. Reasonable security[1] needs to be considered rather than a degree of security that is sufficient and proportionate to the requirements of today's globalized world. In addition to stable national and international relations, this required degree is also based on its sustainable development, which requires a comprehensive and systematic understanding and examination of all components of the social, political, economic, natural, technical, and technological environment. And this is also one of the reasons why, when defining the term security, there is no consensus on the interpretation of this term (Ušiak, 2010, p. 25). The issue of security is extremely broad and the analysis of factors that affect the possible starting points of its research is still an inexhaustible topic.[2] Like any concept, the concept of security must reflect the changing dynamics of social life and the security environment. Given the establishment of the Copenhagen School in the 1980s, the expansion and deepening of security theory is thus considered a permanent trend (Ušiak – Lasicová, 2011, p. 161).

Therefore, the primary goal of the author of this study, following previous research and work in the field of security, is with the use of relevant methods in interdisciplinary scientific research (theoretical analysis and synthesis, qualitative and content analysis, methods of theoretical generalization of knowledge, methods of description, etc.) to contribute to the development of the emerging theory of security, to expand the theoretical and perceptual foundations of security and to offer readers from the professional as well as the lay public verified and new information in the field of security. The presented methodology is based on a heuristic approach applied in qualitative research in security and political sciences, analysis, synthesis, and comparison of possible starting points processed in theoretical analyses and practical constructs of renowned authors from domestic and foreign academic environment, which reflect the concept of security from the point of view of system theories.

1 BASIC THEORETICAL BACKGROUND OF SECURITY RESEARCH

The development of views on security has undergone a relatively rich historical development. The very concept of security is the subject of dozens of publications, books, textbooks or monographs, hundreds of scientific and professional studies, articles or contributions from various conferences and a huge number of other works published or presented around the world. Their authors bring a whole range of different views, approaches, and perspectives on security. In this context, it is necessary to mention Jurčák (2009, 2020), Hofreiter (2004, 2006, 2019), Volner (2005, 2007, 2012), Nečas (2006, 2010, 2011), Bučka (2010, 2012), Ušiak (2010, 2011, 2012), Kazanský (2011, 2013, 2018), Kelemen (2010, 2013, 2015), Majchút (2018), and Murdza (2005, 2017) from Slovakia. In neighbouring countries, the development of security theory and its sectors have been mainly addressed in Poland, such as Korzieniowski (2008, 2016), Piwowarski (2017, 2019), Chojnowski (2015) or Domalewska (2019, 2021), and in the Czech Republic, for example Porada (2017, 2019), Lukas (2017, 2020), Sak (2004, 2018), Eichler (2006, 2009) or Kavan (2020). Of the world's

[1]The need to seek a sufficient and adequate level of security for citizens stems from the need to find a level of security measures that really meet the security needs, interests, but also the capabilities of the state, which reflect its military-political, economic, socio-demographic, technical or technological capabilities. However, the society can only guarantee what it has and what it has for it. In the case of security, it can only guarantee the security that the security potential has at its disposal and the security capacities it has created (Murdza, 2017, p. 362-369).

[2] For this reason, the search for security can be considered an "endless process" that characterizes modern society (Murdza, 2005, p. 251).

authors, Buzan, Waever and Wilde (1998, 2005), McSweenney (1999), Bailliet (2009), Purpura (2011), Collins (2016) or Smith and Brooks (2012) cannot be overlooked.

The dynamic development of human society in recent years brings, among other things, dynamic changes in the development of the security environment and the security situation. This in turn not only generates a number of new asymmetric security threats and risks and the security measures needed to eliminate them, but also changes the way politicians, political scientists, scientists, soldiers, security and other experts think about security, what point of view they look at it and how they approach it. Because there is no generally binding interpretation or a valid and unified definition of security, there are many different approaches to its examination. Therefore, it is quite logical that each of them emphasizes different factors. In this context, Eichler states that individual schools and the authors themselves differ in their approach to safety and its definition in a number of aspects. Each of them has its strengths and weaknesses (Eichler, 2009, p. 23).

Depending on the possible point of view of security, the chosen approach or position, the variance between the views and interpretations of the term for some authors is either none, very small or, on the contrary, very large. Even no intersection can sometimes be found between them. The only unity is that security is a difficult concept to grasp. Therefore, it is basically impossible to determine exactly what this term means, or to assign unambiguous numerical values to it, in contrast to a number of quantities known from the natural or technical sciences (McSweeney, 1999, p. 13). However, it is certainly possible to agree by consensus that security is one of the highest values, which is a prerequisite for the development of mankind and a guarantee of the freedom of human society. At the same time, security is one of the basic human needs that must be constantly developed, protected, and met (Hofreiter, 2006, p. 54).

1.1 Terminological background of the concept of security

The term of security is a common part of every language. Even every individual has a certain general and at least roughly identical idea of what safety means. However, from the point of view of the professional context, the term security, despite the large body of professional literature, is often used intuitively, ambiguously, which means that the discussion often suffers from considerable uncertainty. The source of ambiguity in this complex concept can be the confusion of two basic meanings of security. Therefore, it is appropriate to distinguish whether it is security in the sense of a general attribute, character, criterion, resp. characteristics, or security in the sense of an area of activity, sphere, or policy.

In the first meaning of security, in trying to list all the features, characters, some difficulties can arise, because security can take values from zero to completeness. In this case, security can be attributed to anything, such as distance, source of information, or supply of raw materials, and the like. In the second basic sense, security is linked to a functional sphere, a dimension (for example, internal security, energy security), an area of activity (ensuring public order and security) or even directly with policy (security policy). This dimension of meaning is much more dynamic, as it involves not only security processes, but also the conscious and controlled action of specific entities and institutions or groups, organizations, states, or coalitions (Stejskal, 2007, p. 11).

The term security correlates with such conflicting terms as threat, risk, and danger. In the last period, the term challenge has been added to them more and more often, which corresponds to the first notion of security. However, as far as security is concerned in terms of its second meaning, the simple logic resulting from the phrase "where there is a threat or risk, there is security" is not enough, because threats and risks are part of every action, every practical activity.

In addition to various professional books, textbooks, articles, contributions or commentaries, the term security also appears in various general or professional lexicons and interpretive or educational dictionaries, where it is mostly characterized as state, sense of security, stability, order, reliability and especially the existence of a subject without threats. For example, the Dictionary of the Contemporary Slovak Language (2015) defines the term security as "*a state without a real threat of danger, or as a property of what does not pose any threat, danger*." The Glossary of Security Relations (2002) defines security as "*a state where the protection of protected interests is at such a level that the risk of harm to them is minimized*."

The terminology dictionary of crisis management characterizes security as "*the state of a social, natural, technical, technological system or other system which, in specific internal and external conditions, enables the fulfilment of specified functions and their development in the interest of man and society*" (Šimák, 2005, p. 5).

The Oxford Glossary (2018) defines security as "*a state without danger or threat", or as "a state in which the subject is burdened with neither danger nor fear and is secured against possible attack*". The Cambridge Glossary (2018), in turn, defines security as "*a condition in which persons, buildings, organizations or countries are protected from threats such as crime or attacks by foreign countries" or presents it as "a condition in which something is unlikely to fail or will be lost*".

Defining security by its opposite, in contrast, is not an isolated attempt to define the essence of the term. A number of other definitions of security can be found in the literature, as mentioned above. For example, "*security is a situation where threats to an object (usually the state or an international organization) and its interests are eliminated to the lowest possible extent, and this object is effectively equipped and willing to cooperate in eliminating current and potential threats*" (Mareš, 2015).

From the wide plethora of Slovak authors dealing with security, we choose the definition of Volner, according to which "*security is a concrete-historical, dynamic, relative, diverse, multifaceted, multifaceted and multilevel phenomenon*" (Volner, 2012, p. 21). His perception of security is not abstract, permanent, and unchanging, but always concrete, because it concerns a specific phenomenon, process, relationship or thing, specific conditions and circumstances, a specific environment, time and space, and a specific form of expression and quality. Jurčák (2020, p. 5) says that "*the term security is generally perceived as a synonym of the words security, safety, or peace, and at the same time as an antonym of a real threat or danger*".

Hofreiter (2006, p. 32) states that "*security is a condition in which the security risks of the object and its interests are effectively limited, and the object is effectively equipped to limit current and potential security risks*". Holcr and Erneker take a similar view, when consider security to be "*a real, current state, the value of which is always determined by the nature of the danger on the one hand and the means of restraining or averting it on the other hand*" (Murdza, 2005, p. 250).

Korzeniowski (2008), as one of the distinguished representatives of the Polish authors, in his earlier work, defines security as "*a certain objective state, which consists in*

the absence of a threat that is subjectively felt (perceived) by individuals or groups of people". In recent work, he has already partially modified this definition and defines security as "*an objective state that is a function of the level of threat and defence potential*" (Korzeniowski, 2016). Further significant representatives from the Polish Security School, Pokruszyński and Piwowarski (2019, p. 78) consider security to be the highest, absolute, and eternal value, necessary for the development of human society. The highest, because it is the basis of everything we do; absolute because it covers all sections of society; and eternal, because it is necessary at every stage of human development.

Eichler (2006, p. 8), as the representative of the Czech authors, considers security to be "*a fundamental value and the highest goal of any state or security community uniting several states*". Ukrainian academician Zaplatynskyi (2009, p. 61) speaks of state security as "*a state that enables the functioning, stability and development of the state, preserves peace, sovereignty, territorial integrity and inviolability of borders, internal order in the state, fundamental rights and freedoms of citizens and protection of life and health of people, property and the environment*". Serbian scientists Todorović and Trifunović (2020, p. 11) consider security to be "*the science of the state of the state and the processes in the state, specifically the state and processes that enable the normal functioning of the state and development*."

From other foreign authors, we select, for example, the opinion of Purpura and Bailliet. Purpura (2011, p. 52) defines security as "*the removal or resistance to potential harm (or other undesirable coercive change) from external forces, where the recipients (technical officers) of security may be persons and social groups, objects and institutions, ecosystems, and any other entity or phenomenon that is threatened by adverse changes in its environment*". In contrast, Bailliet (2009, p. 35) describes security as "*a state in which individuals, groups and states do not feel threatened by serious threats, or are considered to be effectively protected from them, and can create their future according to their own ideas.*"

By synthesizing the previous definitions, we emphasize the broader gnoseological context in the study of safety, which is a complex, multidimensional phenomenon. Not only Hofreiter (2008, p. 106), but also Lasicová and Ušiak (2012, p. 28) refer to this. According to them, "*security is a complex concept, a category of being at different analytical levels of individual, group, local, state, regional and global level, where several differentiated, flexible external and internal social factors operate (military, economic, political, social, legal, environmental, energy, cyber), which have the ability to create temporary (relative) stability at the causal level and through which all kinds of crises, risks, threats and wars can be eliminated*".

1.2 Approaches to security definition

When specifying and examining security, the existence of several possible approaches to its definition, which differ more or less from each other, cannot be neglected either. From the end of the 20th century to the present, two basic approaches in the field of security research have emerged on an extensive theoretical level:

a) traditional approach

b) modern approach.

These approaches more closely reflect other assumptions of the definition of security, based on either the negative and positive aspects of security or in terms of a broader and narrower definition of the term.

The traditional approach represents a negative and narrower definition of security. This approach emphasizes the opposition to danger and the related need to ensure the existence and functioning of the entity from external threats. The traditional approach is developed mainly in military theory referred to as "hard security".

The second approach represents a new, positive, and broader view of security. In contrast to the unilateral definition of the military dimension of security and military threats, it perceives security from several aspects based on non-military causes of tensions, crises, and conflicts in international relations (Škvrnda, 2013, p. 395). Such a modern approach is known in security theory as "soft security".

To supplement the above information, it can be stated that the approach based on negative and positive definition of safety is based on the assumption that the safety of the entity (person, group, state, community, etc.) is a very demanding and almost immeasurable quantity.

A positive definition of security is always linked to a certain object, thing, animal, human being, community, state, or security community (grouping, union, coalition) and also to the values that are professed and shared. A secure entity is one that has its survival and opportunities for its further development, is out of reach of direct and urgent threats, or is reliably protected from them. An animal or any other species is secure if there is no natural enemy in its territory. The environment, in turn, is secure when it is not adversely affected by industrial and other human activities (Eichler, 2009, p. 12).

The negative definition of security is based on the absence of a threat, and therefore security is explained as the opposite of the state of threat resulting from the interaction of individual actors who have different interests and preferences. They are also determined to use force, whether military, political or economic, to achieve them. According to the negative definition of security, a state is secure if it is not exposed to any direct and urgent threat, and the ideas based on which it is founded and built are not questioned (Moller, 1997, p. 43-44).

An example of a negative security definition can be the absence of threats arising from the use of weapons of mass destruction in certain countries. Conversely, in other states, the use of weapons of mass destruction may be considered a security threat, where the intervention of the international community or the intervention of that state is already necessary to eliminate that threat, which constitutes a positive definition of security (Nečas – Ušiak, 2010, p. 81). The boundaries are very thin in this case, so the question of defining the limits of positive and negative security has recently come to the forefront of the interest of theorists.

In addition to the above definitions, security can also be viewed through a broader and narrower understanding. In a narrower definition of the term security, the individual authors come out mainly from the military-political concept of security, when the main object of research is focused on the state as the main actor. This means that the breadth of the definition is narrower and there is only one main actor - the state.

In the broader concept of security, individual authors focus their attention on other areas of social life, such as economic, political, environmental, social, energy and information spheres. At the same time, security is perceived not only from one point of view, for example from the point of view of the state, but from several basic points of view, as:

a) individual security - perceived at the level of individuals, not groups or populations;

b) security of national groups - perceived at the level of organized groups within society, interest groups or political parties;

c) state security - traditionally perceived at the level of states as subjects of international law;

d) security of regional groupings - perceived at the level of various regional groupings, such as European Union, African Union, etc.;

e) security of the international environment - perceived at the broadest global international level (Nečas – Ušiak, 2010, p. 81).

Since currently the individual actors operate either at one or several levels simultaneously, the representatives of the so-called The Copenhagen schools (Buzan, Waewer, de Wilde and others) declare that their number and classification are not the same. To compare it with the previous breakdown, according to them, it is necessary to perceive security in the first place, especially according to what security is involved. Based on this, it is then possible to classify all subjects into the following five levels, which are represented:

a) global international systems; these represent the broadest conglomerates of interdependent actors and their relations - such as the UN, the WTO or the global economic system;

b) international subsystems; these are groupings of units that differ in their intensity of links from their surroundings, although they are usually territorially defined - for example, NATO, the OECD, the European Union or the African Union;

c) units representing traditional States; however, at present, strong multinational corporations and non-governmental organizations (NGOs), whose activities are in no way dependent on the power of individual states, have also become autonomous units;

d) subunits, which are groups or formalized networks organized within units;

e) individuals (Stejskal, 2007, p. 23).

Unlike the previous five-level classification, Moller distinguishes only three levels of safety. It is a national, social, and human level. In his conception, the national level is represented by the state. Its content is state sovereignty and power in forms of varying intensity. Social security is represented by collective entities, communities, or groups, and is responsible for the identity of entities and its maintenance. Human security concerns individuals and its content consists mainly of their individual security, survival, and well-being (Moller, 1997, p. 46).

1.3 Comparison of security approaches

As part of a theoretical excursion in the field of security, we consider it useful to compare the well-known approaches to security used in individual countries. Their closer analysis shows that in Anglo-Saxon countries, but especially in the United States, security is considered a reflection of reliable defence and protection of the traditional values of society, the rule of law, defence, and promotion of vital and strategic interests of the state. Security is a state of ensuring the survival of the state, citizens, their independence, and sustainable development. The basic characteristic of security is to safeguard the vital interests of citizens and the state against external and internal threats, which can be real, anticipated and potential.

The German approach to security emphasizes the security of the state and values against external and internal threats. Security, whether external or internal, is mainly divided

into political, economic, and military. It is understood as a state of security for the territory, integrity and inviolability of the state and its political sovereignty. At the same time, these are the basic preconditions for the viability of the state and ensuring the security of its citizens.

The French understanding of security, in turn, is based on the definition of a state of rest in which there is no danger to the subject. Achieving this state depends on a set of measures, procedures and means created and intended for the protection of human lives and property. Security in this sense is a state that depends primarily on external influences and state policy (Marchevka, 2010, p. 42).

The Polish understanding of security is based on the premise that security is the highest, absolute, and eternal value for humanity, necessary for the development of human society at any stage of its development. In connection with security research and the development of security theory in Poland, it is necessary to highlight the comprehensive approach of individual authors to security, to clarify the theoretical aspects of those phenomena, processes, events that allow to properly understand, define, and understand security issues in its entirety.

The Czech definition of security can be found in Czech security terminology, according to which "security is a state where threats to an object with its interests are eliminated to the lowest possible extent and this object is effectively equipped and willing to cooperate in eliminating current and potential threats." it combines a positive and a negative approach, because it understands security not only as an objective state or property of the subject and the environment, but also as a functional sphere including a set of specific activities and processes aimed at ensuring the security of individuals and the state as a whole.

The Slovak understanding of security is defined in the Security Strategy of the Slovak Republic from 2001, which states: “The Slovak Republic perceives its security as a state in which internal security and order, sovereignty and integrity are maintained, democratic foundations of the state and in which the environment is protected. “. The currently valid Security Strategy of the Slovak Republic from 2021 does not directly define security and uses the term security of the state or citizen without defining the content of this term in more detail.

In Constitutional Act No. 227/2002 Coll. on the security of the state in time of war, a state of war, a state of emergency, as amended, security is defined as "a state in which the peace and security of the state, its democratic order and sovereignty, territorial integrity and inviolability of state borders, fundamental rights and freedoms are maintained, which protects the lives and health of persons, property and the environment".

Given that the definition of security is closely linked to the issue of national and international security, it should be noted in this context that the national adjective is associated with the Anglo-Saxon approach to security, not with an ethnic but with a national political definition of security. Therefore, in terms of the use of the attribute’s "national" security or "state" security, we can consider these attributes as synonymous (Marchevka – Németh, 2010, p. 25).

For the purposes of applying the modern approach to security research, it is desirable to accept certain unifying conclusions based on the following statements:

- security is expressed by the existence of basic conditions for life and development,

- security is multidimensional,

- a number of security actors, predominantly non-state actors, is increasing,

- the importance of the so-called non-military security is growing,

- non-violent procedures will be given priority in addressing security concerns (Škvrnda, 2010, p. 485).

2 DIMENSIONS OF SECURITY

The dynamic development of human society and the fundamental changes in the global, continental, and regional security environment that we have seen, especially in the last two decades of the 20th century and in the first two decades of the 21st century, have inevitably brought with them the expansion and deepening of the security agenda. This, as part of the security debate, is subject to the day-to-day real problems it faces. Therefore, to better understand the complexity of this security issue, it is necessary to deal with the multidimensional security model at least briefly.

Moller includes the military, political, economic, environmental, and societal dimensions among the basic dimensions of security. Given the current development trends, which signal the need to expand the dimensional understanding of security, at the end of the second decade of the 21st century, it is desirable to add two more to the above dimensions - information and energy, which are now considered semantically equivalent.

All the above dimensions consist of a relatively wide range of security issues, various entities, institutions or activities and relationships, within which it is possible to identify some other dimensions, such as external, internal, objective, subjective, quantitative, qualitative, etc.

Taking into consideration the current developments in the world, as well as academic and political discussions, it is also possible to consider other security dimensions. Mention should be made, for example, of the technological and infrastructural level of security, or the cultural field of security, which, as the least mapped dimension of security so far, is a necessary precondition for ensuring security in the event of problems and tensions arising from contact of the different cultures.

2.1 The military dimension of security

The military sector has traditionally been very closely linked to security. That is why this dimension is one of the most mapped and developed in the theory of security. In this context, the armed forces play a crucial role, with issues related to the defence and security of the state coming to the fore. This often overlaps the two concepts.

Although after the end of the Cold War, the elimination of bipolarity and changes in the global security environment, the risk of direct military threats from global warfare has decreased and non-military security threats gradually prevail over military ones, in the military sector the state remains a central security player. It is precisely the state that, in this dimension of security, claims its right to survival if it feels threatened.

Despite the currently very low probability of a global war conflict or a very unlikely military attack on NATO or EU member states, a number of local and regional conflicts continue to arise in the world, which may negatively affect the development of the global security environment. On this basis, it is a direct necessity for states to maintain and use

their armed forces, resp. to have them ready for use in the event of a threat to the interests of the state and its people.

Small and medium-sized states integrate into military-political organizations in order to ensure the benefits of collective defence and the protection of common interests, despite the loss of some independence in decision-making. On the contrary, large states are striving - and will continue to strive - to gain the upper hand so that they can circumvent this subordination to collective decision-making, resp. minimizes as much as possible. In this sense, military security will always rely, especially in large states, on the power potential of one's own state and on its relationship to major centres of power.

From the point of view of the military dimension of security, the position of the state will remain paramount. Despite the various current integration trends, the state will always be at the forefront of ensuring the security and defence of its independence, territorial integrity, sovereignty, ensuring the security and protection of its citizens and, last but not least, its interests.

2.2 The political dimension of security

The political level of security - like the military level - has always belonged to the classic dimensions of security. If we perceive the state as a policy tool, it is only natural that the state must have precisely and clearly defined its specific security policy. This represents a multidimensional complex consisting of a set of goals, principles, procedures, and measures of the state to guarantee its security and the security of its citizens. In addition to the traditional defence dimension, it also integrates other dimensions of security, both inwards and outwards vis-à-vis neighbouring states and the international community. The basic mission of security policy is to act on the security environment in order to protect, support, defend, and promote the security interests of the state. After all, the interest of each state lies primarily in the creation of a stable internal situation and a national climate that will allow it to develop normally in all spheres of life of society and the citizens.

The essence and content of the political security of the state thus lies in the possibility of pursuing its independent foreign and internal policy, it lies in the stability of the government and in its ability to solve the problems of the state and its citizens (Hofreiter, 2006, p. 48). The threat to political security can be caused either by the disruption of the organizational stability of the state or by questioning, resp. by not recognizing its external legitimacy, that is, its external recognition as an actor in the international political system (Eichler, 2009, p. 17).

Representatives of the Copenhagen School consider the political dimension of security to be an integral part of all other dimensions because the securitization process takes place precisely through political decision-making. Despite the interconnectedness of all areas, it is also possible in this segment of security to define the basic sources of threat representing potential sources of state vulnerability. Sovereignty, independence, state ideology, the political system and state institutions are the main threats (Buzan – Waever – Wilde, 2005).

Underestimation or insufficient evaluation of the security environment can be reflected in the creation of a security strategy. The security environment and security policy must therefore necessarily interact with each other. On the one hand, this realistically

presupposes an immediate response of the security policy to the dynamically changing external and internal environment of state security, and on the other hand, it also requires a revision and the need to amend the security policy.

Thus, the security policy of the state is not only a practical problem, but it is increasingly becoming a theoretical problem that requires an interdisciplinary approach to its study. At present, state security guarantees simply cannot be avoided without thorough scientific analysis.

2.3 The economic dimension of security

From time immemorial, the economic dimension of security has been one of the most important tools for influencing the security and well-being of national populations. This fact is also declared by the liberal-idealistic concept within the theory of security, which has always developed the ability of the state to implement security measures depending on economic instruments. As stated by Sabayová (2016) a stable national economy, functioning productive, trade and financial relations, a functioning and efficient national economy form the basis of social and spiritual life, they contribute significantly to the development of the state. As they also significantly determine its security, we can state that the economic dimension is gradually gaining a very broad societal dimension. This includes a wide range of microeconomic, macroeconomic, financial and investment indicators, including factors such as economic growth, competitiveness, raw material adequacy, monetary stability, debt level and other.

The current integration of states into transnational economic groupings represents cooperation of states based on the economic principle. On the other hand, it also brings security guarantees and stabilization because countries that cooperate in the economic field aim to deepen this cooperation and not undermine it through various disputes or conflicts, because their basic goal is to create stability and prosperity. At the same time, their goal is to achieve a level of economic security at which the needs of individuals and society are met within economic relations.

The precondition for ensuring economic security is access to financial resources and investments, access to world markets, developed infrastructure, qualified human resources and integration into regional and global economic structures. Economic security creates the basic prerequisites and conditions for the realization of goals in other security sectors. It is a kind of synonym for the social good, which provides benefits to all members.

2.4 The environmental dimension of safety

The environmental safety agenda has not been a direct part of traditional safety approaches in the past. It became a major issue only after the adoption of the United Nations (UN) Declaration on the Environment at the UN Conference on the Environment in Stockholm in 1972. The conference was in the spirit of the motto "There is only one Earth" and marked a significant breakthrough in understanding the impact of the environment on security (Buzan – Waever – Wilde, 1997, p. 81). For the first time, conference participants declared man's right to a favourable environment and proposed a global Earth observation system. At the same

time, the conference identified global environmental issues and threats to them through the regions, which were transformed as priorities into the UN Environment Program.

The issue of environmental security has taken on an even more significant dimension thanks to several natural disasters and ecological accidents that have been recorded in the last two decades of the 20th century and the first two decades of the 21st century. These events have taken security considerations to date in a whole new direction. Since then, environmental security has been linked to a situation where society and the ecological system interact in a sustainable way. The concept of sustainable development is understood as a targeted, long-term (ongoing), complex and synergistic process that affects conditions and all aspects of life at all levels and that satisfies the biological, material, spiritual and social needs, and interests of people, eliminating or significantly reducing interventions threatening, damaging, or destroying conditions and forms of life, does not burden the country beyond tolerable levels and uses its resources wisely.

Sustainable development in the Slovak Republic is legally defined by § 6 of Act No. 17/1992 Coll. on the environment. According to him, this is "development that preserves the ability of current and future generations to meet their basic living needs without reducing the diversity of nature and preserving the natural functions of ecosystems."

Research in this area in recent years has shown that the security and stability of the environmental environment is primarily a matter of transnational cooperation, as they are important aspects of peace, national security and the stability of society. Over the next few decades, there is a real risk of land loss or depletion of natural minerals such as oil, coal and natural gas, which will be used primarily to meet the growing consumption of mankind (Hull – Barbu – Goncharova, 2007, p. 29).

Enough food, but also clean air and especially drinking water are raw materials that will become increasingly scarce in the coming years, based on forecasts of human demographic development, and can therefore cause problems of a fundamental nature in terms of safety. These problems will test the traditional understanding of borders, state security, as local conflict over natural resources can escalate into a regional or even global struggle for ownership of scarce resources. The biggest problems associated with the environmental environment are environmental degradation, in particular the excessive depletion of natural resources and the associated environmental damage and environmental scarcity.

2.5 The social (societal) dimension of security

The social (societal[3]) dimension of security is mainly related to group identity, which has been significantly circumvented in the past. It consists of language, history, traditions, customs, culture, religion, etc. as common values with which social groups identify. Therefore, several experts consider identity to be the basis of the survival of any society.

The reference subjects of the social (societal) sector are mainly entities and groups that have a common denominator - identity, they are any small or larger groups that come together based on collective cohesion and loyalty, which they consider endangered and worthy of protection. There are a relatively large number of risk factors in this area that can

[3] B. Buzan first came up with the term societal dimension in 1983, when he applied it in his multidimensional model of security. However, in the opinion of Waever (1994), the term societal is a bit impractical. According to him, the term identity security would probably be more terminologically adequate.

jeopardize societal security. This includes, for example, not only national groups within the state, but also various transnational groups across several states, such as anti-globalists, neo-fascists or environmentalists, if they think and act as one group. It is precisely association based on national identity that is the greatest threat to the state, as it may lead to the demand for self-determination, which always undermines the territorial integrity of the state, or it may undermine state stability through groups claiming above-standard benefits (Nečas – Ušiak, 2010, p. 89-90).

The state also plays the most important role in this security agenda, through its mechanisms, institutions and means of ensuring social protection. In addition to threats to social identity, it also focuses on the provision of health care to citizens, the provision of social insurance, state social support, social assistance, etc.

2.6 The information dimension of security

The information sector is one of the most dynamically developing sectors of human society in the 21st century. The original classical security approaches never took this direction, and the information level of security did not come to the forefront until the early 1990s. Information security must be seen as a comprehensive approach to information protection. It is a multidisciplinary area, a field that includes not only the technological and physical components, but also the legal, administrative, personnel and social components. The reason for the implementation of information security is mainly:

- penetrating and influencing all dimensions of security through information and communication technologies,
- digitization of society,
- method and techniques of data transmission in networks (Brezula, 2018, p. 145).

The development of the Internet and modern computer, information and communication technologies has not only reflected in the private and economic spheres but is also increasingly and more fundamentally affecting the state and public administration of the state, as well as the military and security areas.

The growing penetration of information and communication technologies into all areas of life is associated not only with a positive but also with a negative effect. On the one hand, their rapid development, massive deployment, and use bring higher quality in almost all spheres of society, but at the same time new threats arise and gradually increase not only for individuals, but also for the state and its security. There are more and more criminal and illegal activities in this area. An active attacker has the means to monitor and analyse the behaviour of even a very complex system in the long term; it is very well equipped not only technically but also in terms of knowledge. The more dependent society is on this dimension of security, the more vulnerable its critical infrastructure area is to the threat of cyber attack (Patel, 2018).

Information security breaches can occur at several levels, from eavesdropping and jamming of telecommunications and information network signals, to sabotage of information flows or even cyberterrorism and cyber attacks on public and private computer networks and systems. As these attacks become more and more sophisticated and complicated, information security is becoming an integral part of national and international security. In this context, it is necessary to ensure legal regulation in the field of cyberspace,

which will ensure an adequate level of protection of critical infrastructure and basic security areas of the functioning of the state (Valuch, 2019, p. 34).

2.7 The energy dimension of security

The energy security sector is one of the most important areas without which the state would not be able to fulfil its basic functions. Energy security is defined as "access to an adequate supply of energy raw materials, in an adequate form and at an adequate price", or as "ensuring a stable, uninterrupted supply of energy in sufficient quantities and at a reasonable price" (Ivančík – Kelemen, 2013, p. 41).

The Copenhagen School originally included this area of security in the economic dimension of security, but development trends in the world prove its validity and significance from the point of view of the sector examined separately. This statement also follows from the fact that it is energy security that is an important indicator of the interdependence of states, and thus of relations between them, which can change significantly in a short period of time.

The main sources of threats in the energy security sector are resource depletion, political instability and manipulation, attacks on resources and infrastructure, industrial accidents or natural disasters, rising energy prices or disruptions in energy supplies. Energy security should therefore be one of the main priorities of every country. It should be based on an efficient supply of energy raw materials, which ensures the development of society, as well as on the stability and diversification of the supply of energy raw materials in order to prevent various disruptions in their supply (Bučka – Nečas – Źechowska, 2012).

CONCLUSION

From the synthesis of the above findings and previous considerations, it follows that security is a complex theoretical-praxeological problem that can be viewed from several angles. Defining security is therefore not at all simple and straightforward. The security is perceived differently by the academic community and differently by an expert from practice. An economist has a different view of security, a politician has a different view and a military, a security and energy expert or ecologist have a different idea of it. One understands it as a state, the other as a manifestation, the third as a result, the fourth as a category and the fifth completely differently. That is why there is currently - and cannot be - no unified and generally accepted uniform definition of security. That is why there is no universal consensus in the opinion or interpretation of this concept. And this is also the reason why it is necessary to distinguish and consider the existence of several dimensions of security (eg military, political, economic, social/societal, environmental, information, energy, etc.), resp. on the existence of several levels of security (individual, group, state, alliance, international, etc.).

Consensus is reached that security can never be absolute, it is always relative and directly proportional to external threats or risks. It cannot be viewed from an extreme position because no entity can achieve absolute assurance of its security. What may be secure at one point may no longer be secure after a change in conditions or circumstances or may become high risk or even dangerous. If a phenomenon or process is secure for one

subject, it can be dangerous for another subject. It follows that security is always associated with specificity, that is, with a particular person, collective, thing, with a particular phenomenon or process, with specific conditions, circumstances, phenomena, and relationships, with a specific space and time, and with a particular form and quality.

Whether security is examined from any point of view, whether economic, political, social, military, environmental, information, energy or even existential, whether the problems are solved theoretically or practically, or are solved on an individual or collective level, or local, state, regional, global or Alliance or Union level, one thing is certain. In the historical context, the issue of security has been, is and - given the dynamics, unevenness, instability, uncertainty, and difficult predictability of the further development of human society - will always be highly topical. Therefore, every single contribution dealing with at least a partial solution of problems related to the established security issues needs to be supported and appreciated.

At the end of this study, I would like to believe that in the near future the need for a multidisciplinary approach using theoretical knowledge, scientific methods and methodological procedures from political, economic, security, military, police, legal and other social, natural and technical sciences to study security will increase. The current situation regarding the coronavirus pandemic is immediate evidence of this.

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THOUGHTS ON THE APPLICATION OF QUANTUM-BASED ARTIFICIAL INTELLIGENCE FOR MILITARY PURPOSES

Szilveszter SZELECZKI

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ABSTRACT

In today's information-based society, computer technology is developing rapidly, and thus the speed of operations is increasing exponentially. Fast and dynamic information processing has become one of the basic needs of countries and their organizations. Furthermore, higher levels of info-communication technologies can also be detected. In the field of computing, quantum computers are becoming more and more popular, and their current development process is particularly intense, which in turn has triggered a kind of competition between the countries interested in the subject. The estimated future usability of quantum computers for humans is currently being outlined. Regarding to the new computing capabilities, quantum informatics is closely related to artificial intelligence and military forces can gain unprecedented information superiority through the development.

KEYWORDS

Quantum informatics, computing, military, informationprocessing, artificial intelligence

INTRODUCTION

Information Technology (IT) devices and their networked systems have increasingly high-quality computing capabilities, which are constantly tested and challenged by the human society. The evolution of computer technology is reflected in more versatile devices, both physically (in size) and in software (in functional performance). Communication and information techniques are hierarchically intertwined, to which their cumulative info communication interpretation capabilities can be attributed. With the development of the aforementioned skill, the need for information services is also critical. On account of rapid development, the machines are almost reaching the theoretical limits of their performance. The information demands of military forces are periodically growing. (Farkas, 2020) More and more info communication tasks are waiting to be solved, which seem to be hopeless and impossible to solve with traditional computing capacities. (Farkas, 2021) Artificial intelligence and their suboptimal development solutions come into play here.

Therefore, the question is simple: **What information operations capabilities does artificial intelligence and quantum-based computing hold in modern warfare?** The possibilities of quantum-based mechanics on one hand shrink the circuit elements to atomic dimensions. On the other hand, the computation time is significantly decreased. The aim of this paper is to present the IT aspects of artificial intelligence and quantum space time, as well as to theoretically examine the possibilities of using these capabilities specifically for military purposes.

Quantum informatics is not only a current issue, but also a very interesting topic for the future, which is why it is useful to examine this field. The author conducted a literature search. After analysing the processed papers, he draws conclusions on the researched topic. Following the general analyses, the results are used to examine military applicability. The author presents the partial results in chapter 5 based on his own practical ideas.

1 MILITARY INFORMATION OPERATIONS

Military information operations are performed on land, in water, in the air (including space operations and cyber warfare). Information-related military operational capabilities can be divided into three groups: IS (Information System), CS (Communication System), CIS (Communication and Information System). Information and communication systems consist of tools, methods, procedures and the personnel who operate them. The purpose of information systems is to implement information processing capabilities, while that of communication systems is to provide data transmission capabilities. The term info communication system is the synthetic name for these two types of systems. In military information operations of the 21st century, data is being processed in staggering amounts at high speeds. Figure 1 shows the extent to which information operations characterize military operations.

Due to the growth of information capabilities, the rise of interest in quantum-based computers displays similarity to their classical counterparts. Interpreting the information operations of the quantum world is a bit cumbersome. Quantum effects such as interference and concentration play an important role in quantum-based information operations. Scientists are trying to assess and estimate the set of these abilities. In classical computing, information operations are performed by logical algorithms. Quantum informatics subverts these algorithms, which can be divided into four groups (namely information gathering, information storage, information processing, and information transmission). Each of these capabilities is involved in a number of areas of military operations.

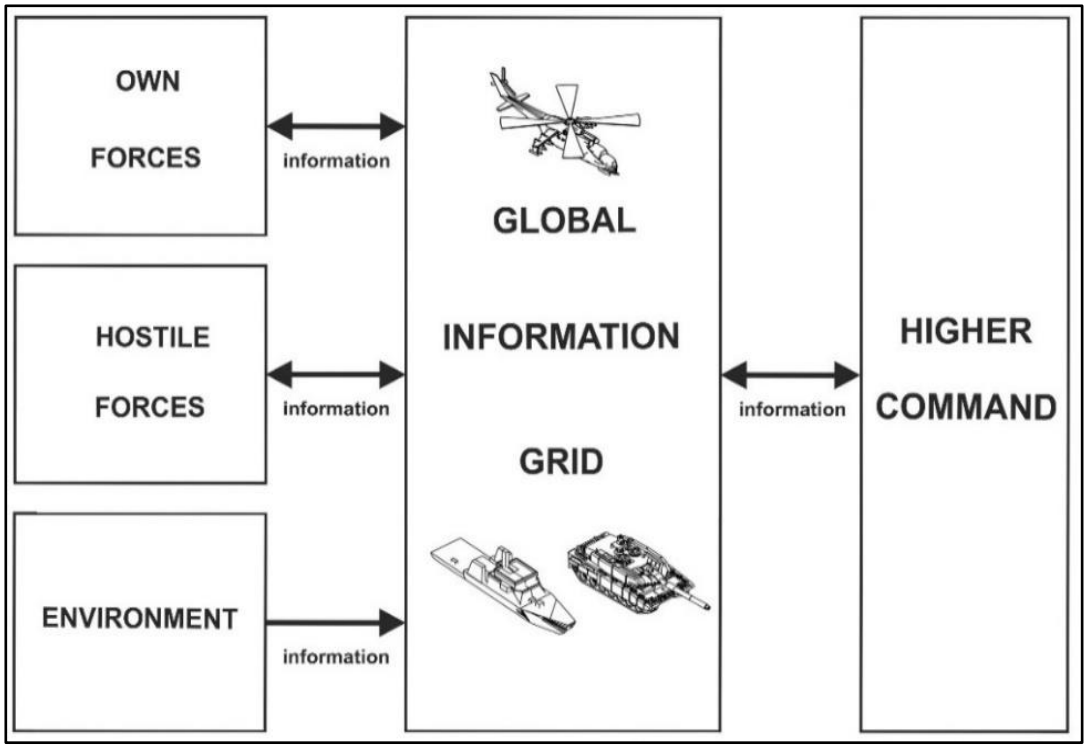

Figure 1. Classic military IT operations.

Source: Created by the author.

2 INFORMATION SUPERIORITY

As in most sectors, the conquest of information technology is not an unknown concept in the defence area. In order to gain information superiority, a kind of competitive situation can easily develop between different military forces. According to one interpretation, information superiority can be defined as follows: "*The operational advantage derived from the ability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same*." (USA, 2014, p. GL3) The expanding role of information technology can be clearly felt in the defence sector as well. In today's digital world, computers solve quite a few difficult tasks, by which they also have a serious operational responsibility. "*Information Superiority is a key component to the Global Information Grid (GIG). The GIG includes all owned and leased communications and computing systems and services, software (including applications), data, security services, and other associated services necessary to achieve Information Superiority. Essential elements of Information Superiority include:*

- *Command and Control (C2);*
- *Military Communications;*
- *Computers;*
- *Intelligence, Surveillance, and Reconnaissance (C4ISR);*
- *Information Operations (IO).*"(AcqNotes, 2017)

In contemporary information warfare, the trio of the already classic land, naval, and air forces has been augmented by two other major services, operations in cyberspace and space warfare. Figure 2 shows that military-political modernization processes are a typical example of cyclical competition between nations to gain information superiority. As the information needs of military operations and the available technologies increase, there is a constant struggle to gain information superiority. Social media and military intelligence are extremely important roles in the information strategy of nations. This is why information security and cyber security are high priority military areas today.

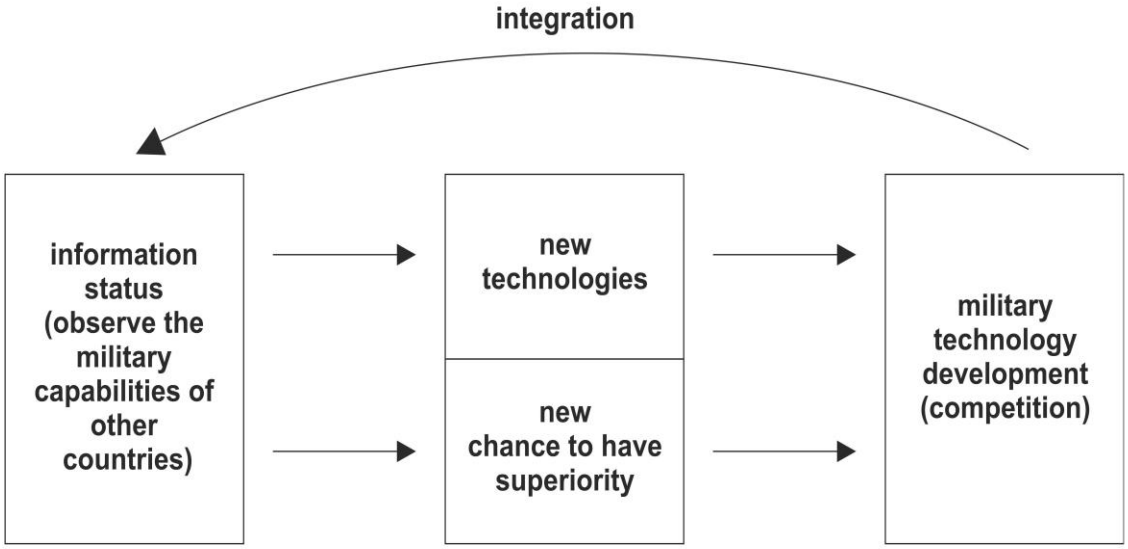

Figure 2. The competition between nations in military technology development.

Source: Created by the author.

3 QUANTUM INFORMATICS

3.1 Historical overview

The beginnings of quantum informatics (and with it quantum electronics) can be traced back to the 1970's, even though major computational results began to appear in the early 1980's (all of which at the time were not proven). In 1981, it was Richard Feynman, a physicist, who was interested in creating the term quantum computer, which is well-recognised by modern technology. "*How can we simulate the quantum mechanics?… Can you do it with a new kind of computer - a quantum computer? It is not a Turing machine, but a machine of a different kind*."(Hey & Ross, 2016, p. 11) The first results, which could be applied in practice were achieved with the advent of the algorithms applicable for later

quantum computers. These can be traced back to the 1990s. The Grover search-algorithm[1] for example proved to be more efficient than the similar algorithm of conventional computers. In the 21st century amongst the improvement of classical computers the fist Quantum-computer was officially introduced (2007) by D-Wave Systems. From then on, due to the experience, quantum-informatics and quantum-computers became more popular and well-known. In Figure 3, the Orion processor is presented, which was used by the first quantum-computer. Formally, it is only a chip, but it presents a milestone in computer technology.

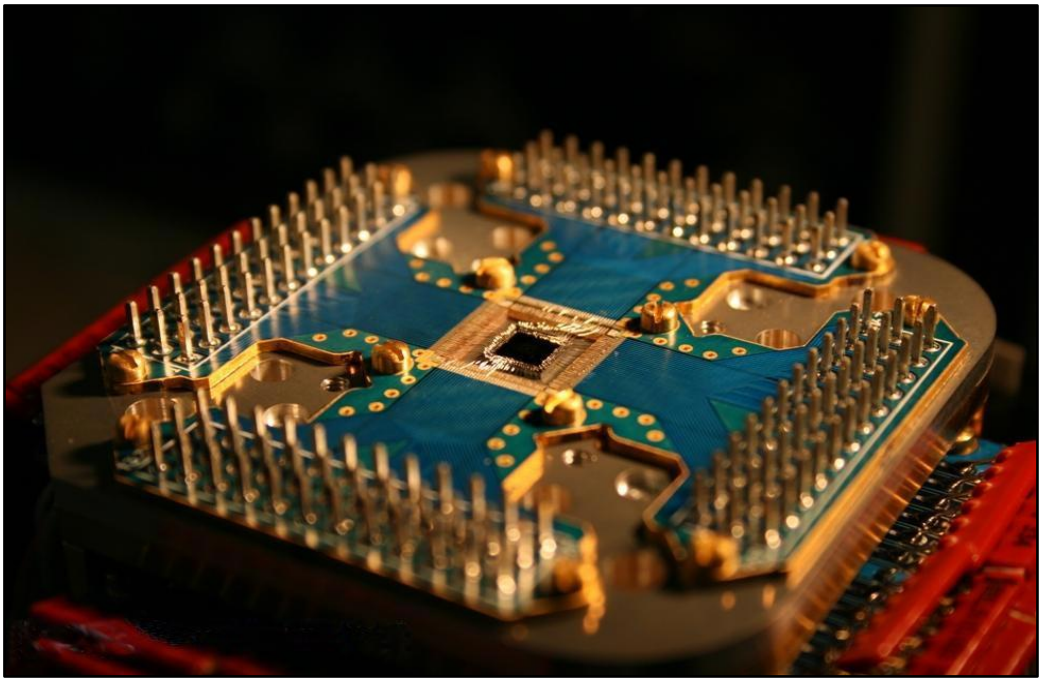

Figure 3. D-Wave Orion (16-qubit) processor.

Source: (Gingichashvili, 2007)

Later, quantum informatics became increasingly intertwined with for example, cryptography and the scientific fields of artificial intelligence, by which scientists working in computer technology were able to open a new door to modernisation. Nowadays large companies like IBM or Google, and many research teams are working worldwide to create and develop quantum computers which offer higher quality and power. Much like president Kennedy could not predict the benefits of space exploration to society in the 1960's, a similar pattern can be observed in the development of quantum computers today. What is certain is that there are very exciting aspects of quantum informatics that are worth learning about. The possibilities of using quantum computers will be outlined as developments progress, and so will their possibilities for application to military tasks.

[1]The Grover algorithm is one of the best known algorithms in quantum computing. Solving the problem is often called as "database search".

3.2 Interpretation of quantum computers

The first proven event in quantum informatics took place in the spring of 2007 by D-Wave systems, and since then there has been ongoing testing and development of quantum computers practically all around the world. The Orion quantum processor showed the way towards solving more difficult, time-consuming calculations. Since the first results, quantum computers are being tested non-stop, by tasks designed specifically for this purpose by scientists. By virtue of the technology, the time needed to solve computationally intensive tasks is dramatically reduced compared to current computers. A typical example of such problems is the travelling agent situation where one needs to find the shortest path between different cities and addresses. This presents an interesting challenge, as the list of addresses to visit grows as one examines every opportunity (after each new address) to find the most optimal path. To understanding quantum computers knowledge of basic operating principles is required. "*Quantum computers are machines that use the properties of quantum physics to store data and perform computations*" (Lu, 2021).

Just like in the case of classical computers, in the quantum world algorithms play a major role, only in a slightly different way. In connection with quantum algorithms[2], the following types of basic phenomena can be distinguished:

- quantum teleportation;
- quantum parallelism;
- quantum search.

One of the essential fundament about the operation of a quantum computer is that information is stored in quantum bits, also known as qubits, which can come from a wide variety of materials. In theory, any of them which has two well-distinguishable states is suitable for this task. An example is a photon (a particle of light) which has two polarizations perpendicular to each other, but other divalent atoms or ions are similarly suitable.

As shown in Figure 4, qubit differs from the traditional bit in that it can take 0 and 1 values at the same time. This principle is valid exponentially for the number two in case of multiple quantum bits. If for example a computer is based on 10 quantum bits, then the number of values possible at the same time is 2^{10}. The value of qubits can vary widely between states as a function of the probability created by quantum phenomena. As a result, the more qubits a quantum computer has, the greater its computational capacity.

The second important fundament about quantum computers is the so-called "spin" feature. "*Spin is a bizarre physical quantity. It is analogous to the spin of a planet in that it gives a particle angular momentum and a tiny magnetic field called a magnetic moment. Based on the known sizes of subatomic particles, however, the surfaces of charged particles would have to be moving faster than the speed of light in order to produce the measured magnetic moments. Furthermore, spin is quantized, meaning that only certain discrete spins are allowed. This situation creates all sorts of complications that make spin one of the more challenging aspects of quantum mechanics.*" (American, 1999)

[2] A detailed reading on quantum algorithms can be found in John Preskill's "Quantum Information Chapter 6. Quantum Algorithms" writing, which document can be accessed on the following link: http://theory.caltech.edu/~preskill/ph219/chap6_20_6A.pdf

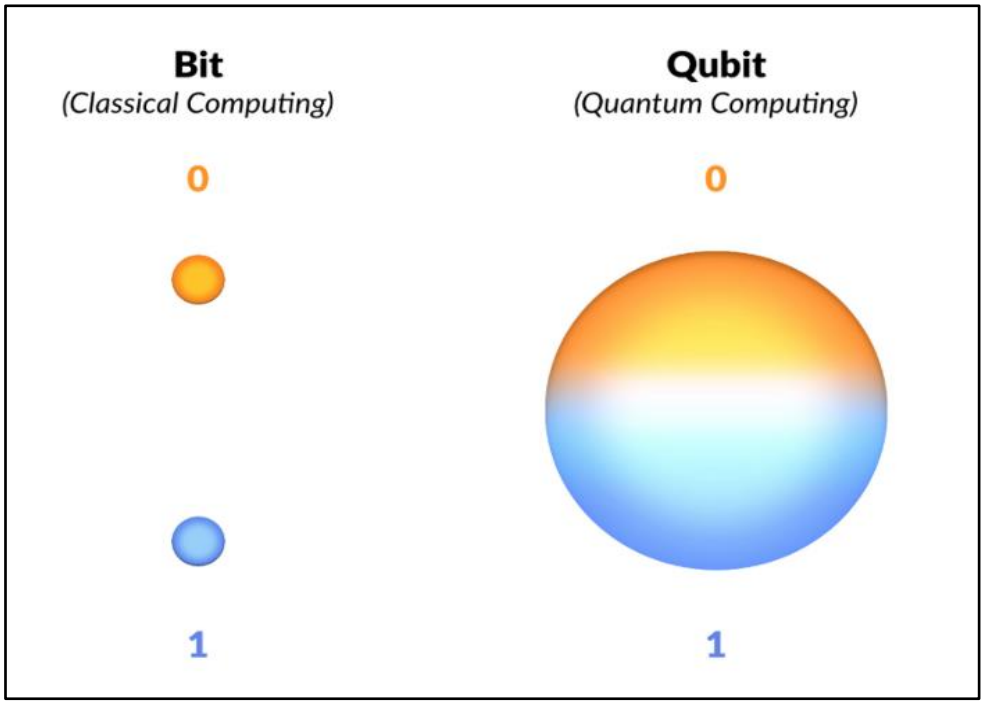

Figure 4. Difference between bit and qubit.

Source: (Dumon, 2019)

Spin is therefore a wave function describing the properties of a particle, providing the transformational properties against rotations (mass, electric charge or polarity...). Spin has equivalent definitions including impulse moment or rotational impulse torque. The physical state of electrons can be utilised to represent binary information. The spin of the electrons pointing towards north may represent the logic one and the spin pointing towards south may represent the logic zero. Like electrons, the nuclei of atoms have spins. The qubits used in a quantum computer show an uncertain value until the measurement result is obtained. Qubits can take on multiple values, which can be measured in probability values instead of logical values until the moment of measurement. Owing to this free space of values, quantum computers can have significant computing capacities on the scale of millions compared to traditional machines.

Exploiting the power of quantum computers is beginning to emerge as a significant symbol of power in the public consciousness, creating some sort of competition amongst ambitious countries at the same time. In connection with this, new concepts have emerged, such as quantum dominance and quantum supremacy. These special concepts can be applied to a given country, based on the level of quantum informatics of competitive players, on the acquisition of some research and development advantage. All of this may seem to be, of course, a strong statement, not to mention advertising, but today there exist quantum computers (such as the D-Wave Q2000 in Figure 5) that surpass their traditional counterparts in certain tasks. The D-Wave Q2000 is relatively large in size, taking up half of a room. All of these advances in computing are reminiscent of the advent of traditional computers, the first pieces of which were also large in size.

Dimensions and capabilities have changed quite a bit since then. In connection with the development of computing technology, it is worth paying attention to cryptography, which is on the path of significant development in quantum computing.

Figure 5. D-Wave Q2000-quantum-computer.

Source: (D-Wave, 2016)

3.3 Quantum cryptography

Classical cryptography uses symmetric and asymmetric key encryptions, of which perhaps the most reliable and well-known version is the RSA public key asymmetric algorithm. The result of a properly executed RSA encryption (due to its computational theory) cannot be decrypted quick enough that it would be worth attempting. However, it has still not been demonstrated that there is no algorithm with sufficient speed to decrypt encrypted data. Quantum-based computing can be used in special environments for difficult, time-consuming tasks. Other time-consuming computational tasks include code-breaking, which is considered critical from a military point of view (given the divers of classified data). Of course, access to unauthorized classified information poses a significant security risk. A new discipline has emerged in this field of science, called quantum cryptography.

Quantum cryptography or encryption uses the principles of quantum mechanics to encrypt messages in such way that no one but the recipient is able to read them. It takes

advantage of the multiple states of quantums and the fact that a given state change does not go unnoticed. "*Quantum cryptography, or quantum key distribution (QKD), uses a series of photons (light particles) to transmit data from one location to another over a fiber optic cable. By comparing measurements of the properties of a fraction of these photons, the two endpoints can determine what the key is and if it is safe to use.*" (QuantumXchange, 2021)

From a military perspective, the storage of encrypted data is of enormous importance as hacking it can provide any force with a huge information advantage. It has become evident that the technological development of coding procedures must also be taken into account by defence sector. Quantum cryptography is now an intensively evolving lore, for which the creation of standards is supported by the National Institute of Standards and Technology (NIST). Military organizations are likely to use the technology in the future, so the following steps should be taken in a timely manner:

- learn about the possibilities of quantum cryptography (the standards) and draw conclusions (advantages and disadvantages, short- and long-term goals);
- make decisions (selection of procedures and tools, time planning) related to the introduction of new cryptography;
- designate military staff who will learn new cryptography in depth and utilise it in accordance with their profession.

Military forces are being attacked in cyberspace on a daily basis in a myriad of ways, as a result of which one needs to be to prepared for any situation. "*Hackers today can just steal sensitive data that is encrypted using current algorithms and then decrypt it later when the quantum computers are available. So businesses need to address this threat now with quantum cryptography so that their organizations data, applications, and IT infrastructure remain protected for many years into the future.*" (Sectigo, 2020)

It can be felt that quantum technology is a particularly interesting field, the research of which is clearly timely. Your computing skills will become applicable in more and more areas and at higher and higher levels.

In the specific opinion of the author, the study of the possibilities of quantum informatics for defence purposes (especially with regard to military application) and the appearance of the related official requirements are completely realistic for the future.

4 MILITARY USES

4.1 Artificial Intelligence (AI)

Artificial intelligence is part of the latest generation of computers, representing state-of-the-art and efficient computing capabilities. It can be divided into three main groups: Artificial Narrow Intelligence (ANI), Artificial General Intelligence, AGI) and Artificial Superintelligence (ASI) (European Union, 2020, pp. 5-6). ANI is utilised to perform a single function or task, and is now typically found in background services of smartphones that are in connection with installed applications (e.g. voice recognition). AGI on the other hand does not target a specific task, nor solves only certain tasks, but learns and argues to achieve a desired outcome.

Moreover, it understands complex concepts, therefore at this level of intelligence we can consider the phenomenon of the matching of that of human intelligence. ASI surpasses the aforemationed concepts, and in itself represents a level of ability that is smarter than man in all aspects, possibly resulting in two, ten or even thousand times the level of intelligence. As shown in Figure 6, the fields of application of present day artificial intelligence represented as a non-exhaustive collection of items, are as follows:

- logical tasks, agents;
- robotics;
- speech and image processing;
- action plans;
- neural networks;
- data mining.

Figure 6. Artificial Intelligence in military oprerations.

Source: (Soffar, 2021)

The learning algorithms of machines provide a significant military advantage over the adversary party in gaining and sustaining information and leadership supremacy. Different information needs arise at the professional team levels of the military, making the military application of artificial intelligence quite diverse. Applying the technology requires an intricate management decision. "*Effective policymaking and responsible use will also require government and military officials to have some knowledge of how AI systems work, their strengths, their possibilities, and their vulnerabilities.*" (Stanley, 2019) Artificial intelligence may be used in any arms of force, such as autonomous weapons, equipment and vehicles (transport Unmanned Ground Vehicles (UGV), strike and reconnaissance Unmanned Aerial Vehicles (UAV)), cyber security (e.g. security surveillance with image processing), logistics (e.g.

logistics action plans), networking (learned routing). Conclusively, inferring from the applications of artificial intelligence, the development of quantum-based artificial intelligence for military purposes is may easily become more than an intriguing innovative vision.

4.2 Quantum Artificial Intelligence (QAI)

By placing artificial intelligence on the foundations of quantum informatics, a common discipline denominated as Quantum artificial intelligence had been created. This discipline is an interdisciplinary field that focuses on improving the computational tasks of artificial intelligence by creating quantum algorithms, making areas such as Machine Learning (ML) more efficient. The use of quantum algorithms in artificial intelligence increases machine self-learning. The machine learning algorithms of artificial intelligence (supervised and unsupervised) are suitable for information operations related to unique properties (e.g. face recognition). By placing artificial intelligence on a quantum basis, the following areas of military advantage can be developed:

- Speed of Decisionmaking (and Decisionmaking Support);
- Use of Big Data;
- Improved Targeting and Vision;
- Mitigation of Manpower Issues;
- Improvements in Cyber Defence;
- Improvements in Accuracy and Precision;
- Labour and Cost Reduction;
- Improvements in Intelligence, Surveillance, and Reconnaissance;
- Ability to Operate in Anti-Access/Area-Denial Environments;
- Improvements in Deception and Information Operations. (Morgan, et al., 2020, pp. 16-20)

In scientific research, artificial intelligence is becoming a tool for experimenting with quantum systems. Through artificial intelligence, it is easier to understand the main equations of quantum mechanics that require high-performance computational resources. By applying quantum computational algorithms to artificial intelligence techniques, a completely new concept describing an intertwined field, Quantum Machine Learning (QML) had been created.Quantum machine learning can be provably shown to be more effective than classical machine learning.*"Several fascinating results have shown, for example, robots deciding faster on their next move, or the design of new quantum experiments using specific learning techniques."*(ScienceDaily, 2021)

The idea of representing multiple states simultaneously used in quantum computing is especially convenient for the optimal use of artificial intelligence techniques. The use of quantum algorithms can help with improving accuracy, increasing processing performance and the amount of data the system is able to handle. Quantum computing boosts the number of computed variables, hence allowing for a shorter response time. Logical optimization based on quantum computing clearly has a positive effect on the development of artificial intelligence. In case of communication systems (e.g. satellite communication), it can increase a given channel's quality, and can provide effective security solutions (for

example, through the already mentioned quantum cryptography). Anyhow, rapidly and confidently operating military information systems require large information capacity.

Quantum-based artificial intelligence can even make it possible to mimic the operation of the human brain and calculate its optimal use. The human brain is based on a neural structure that is almost unimaginably complex, having reached its current level of development over millions of years, that scientists today are trying to decipher and imitate. The previously discussed results of evolution give way to the development of the latest robotic technology for instance. "*Certain senses of the brain can be modelled in a machine learning system For e.g. vision (using deep neural networks)*." (Angeri, 2018)The functioning of the human brain is difficult to replicate for the reason that as it is proven by scientists, its development has not been finished yet. The expansion in size and complexity of our brains, which played a significant role in human evolution, is probably not considered complete even today.

Despite the fear of complexity, serious results can be seen nowadays in the field of artificial neural networks. The supercomputer "Dubbed Spiking Neural Network Architecture", SpiNNaker for short, has been built at the University of Manchester in England. The purpose of the computer is to simulate the functioning of the human brain (creation of neural models). What is new is that it has computational capabilities to simulate the operation of more neurons in real time than any other machine used to be able to do before. "*SpiNNaker is a 1-million ARM core digital neuromorphic machine currently in use to explore theoretical and computational neuroscience simulations and neurorobotics applications*." (Bogdan, 2020)The quest to create an artificial brain has resulted in the creation of the self-learning robots of today that can be used for military purposes. An unmanned reconnaissance aerial vehicle or a troop transport vessel may also have advanced capabilities that can be utilised with a high standard of artificial intelligence.

Quantum artificial intelligence can provide an opportunity to develop all these complex information operations. Figure 7 symbolically illustrates the military model of the quantum informatics room as an interdisciplinary workshop where even significant military operations can be planned using molecular, elementary-levels. The author concludes that artificial intelligence is much more well-known and accepted in the defence sector than quantum informatics. Of course, this does not mean that this cannot change in the future, moreover, it can be assumed that the interest in quantum informatics will increase significantly. Artificial intelligence can be exploited from the military side in many ways, due to growing information needs. In the opinion of the author, both areas can develop all these needs in the future, which is why the creation of an interdisciplinary area specifically for military purposes is a realistic picture.

Figure 7. The future of military use of quantum-informatics.

Source: (Livermore, 2019)

5 PRACTICAL THOUGHTS

Taking the previously discussed theories into consideration, let's forget the limitations of present day for a while, and rethink the assumptions that answer the basic question posed earlier about information operations. Imagine the reason because of which the connection between quantum computing and artificial intelligence can mean innovation in modern warfare. Participants in military operations can be divided into combat, combat support, and combat service teams. Within all three areas, human ability has been supported by machines, due to advances in military technology. With the development of increasingly advanced self-learning algorithms, artificial intelligence is now making a significant contribution to the defence industry.

One of the best and simplest examples of developing and optimizing learning processes is the use of robots, which has appeared in many forces today. The deservedly famous Turing[3] test can be used for the purpose of hypothesising that a given machine can think. The also well-known John Searle's Chinese room[4] questions Turing's proposition with the exposition that only when the conditions (instruction set) are known the ability of a 'machine learner,' so to speak, to think can be established. Machine self-learning and intelligent behaviours are widespread in contemporary military operations, and thus the

[3]Alan Turing proposed a test based on indisputability from an intelligent entity - a human being. The computer passes the test if the human expert is unable to decide which set of the written answers to previously proposed questions had been provided by the computer.

[4] John Searle's "critique" of the Turing test can be easily understood through the video which can be accessed on the following link: https://www.britannica.com/video/186419/room-argument-critique-John-Searle-Turing-test

question is simple: **Where should one draw a line separating an instruction set from genuine thoughts with regard to the development process?**

The current technological situation to date is that there exist two areas in which machine intelligence can presumably be raised to a higher level. Fields within the development of artificial intelligence, such as natural language processing (for human language dialogue), storage of known or heard information, automated inference, machine learning (adaptation to new conditions), computer vision (object identification), robotics (object movement) can also be used for military purposes. The computing capabilities of quantum-based computers are millions of orders of magnitudes greater, while and showing characteristics of the possibility of further growth as well. From Figure 8, one is able to understand that, given the learning abilities of artificial intelligence are placed on the foundations of a quantum computer, completely new and significantly faster QAI algorithms can emerge.

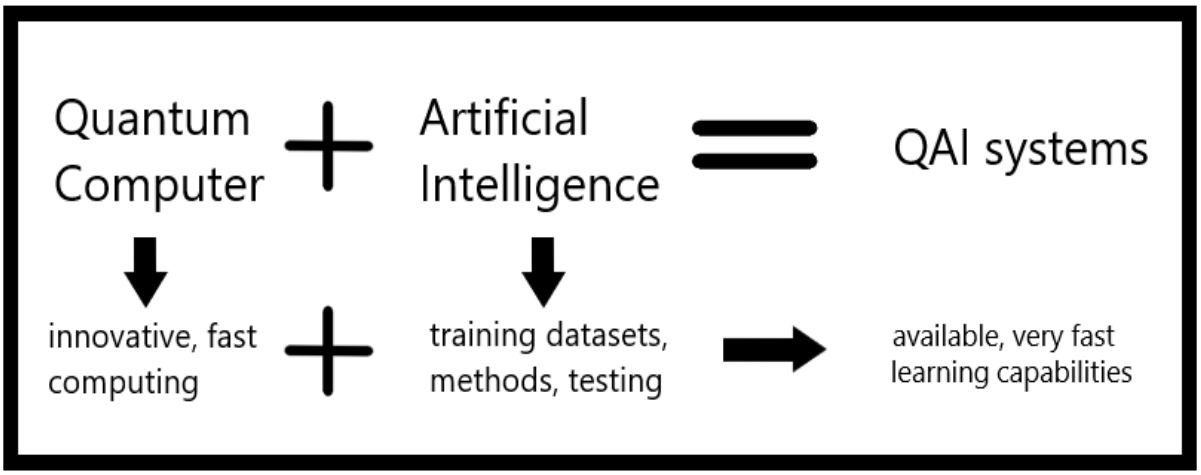

Figure 8. Components of QAI capability.

Source: Created by the author.

CONCLUSIONS

In terms of daily average information operations, data in today's 21st century society is clearly becoming a part of everyday life in almost unimaginably large quantities. Information space is appearing in more and more diverse networks, which affect approximately all infrastructures, including national defence. Data storage systems are continuously targets of attacks in defence organizations, therefore the introduction of machine learning methods has great potential to increase the effectiveness of respective defence systems. The rapidly growing demand for information requires an ever-higher level of computing technology.

Quantum informatics (including quantum cryptography) and artificial intelligence can be considered a central issue in information operations, and the real military applicability of the future of these fields (referring to vehicles and devices mentioned before) is to surface in the upcoming decades. "*The technology is being developed for many civilian applications*

and the military sees it as potentially game-changing for information and space warfare."(Erwin, 2018)

Artificial intelligence will systematise a vast set of computational algorithms, amongst other ways by examining the functioning of the human brain. Professor Stephen William Hawking said: "*I believe there is no deep difference between what can be achieved by a biological brain and what can be achieved by a computer. It, therefore, follows that computers can, in theory, emulate human intelligence — and exceed it.*" (Gall, 2018) The discovery of a deeper understanding of quantum materials science through artificial intelligence is likely to change contemporary forms of warfare, which is eerily reminiscent of the technological revolutions of the 20th century.

Artificial intelligence is one of the most diverse fields in military applications, thus making them based on quantum-based algorithms can be a significant milestone in modern warfare. In order to gain information superiority, the military forces of the future may engage in a number of activities in cyberspace that will put information technology at the forefront by an unprecedented importance. Artificial intelligence and quantum computing have become increasingly well-known and important in the use of military forces in connection with developments in information operations. Russian president Vladimir Putin said: "*Artificial intelligence is the future of not only Russia, but of all mankind. Whoever becomes the leader in this sphere will become the ruler of the world.*" (Gigova, 2017) By analysing quantum phenomena in bio-molecular systems and using algorithms based on artificial intelligence, the military use of information operations can provide ideas in a significantly new philosophy in modern warfare.

To answer the question proposed at the beginning of this document, as the development and mobility of quantum computers progresses, the technology is bound to end up in buildings, vehicles and a wide range of devices. The QAI capability can be used in information operations in conditions of combat, combat support, and combat service. Evolving from the current level of artificial intelligence (e.g., UGV, UAV), the creation of a mechanized, intelligent military technology that has the ability to compete with (Turing test, Searle's Chinese Room) and even surpass (AGI, ASI levels) human thinking may surface. All of these are likely to lead to the development of new algorithms, info communication protocols and proposals in military applications. In the opinion of the author, in connection with the two areas presented and examined, numerous questions may arise regarding the application of skills. Research in the areas is important and it can be seen that more and more publications are appearing on the topic. There is a clear need for research on artificial intelligence from both civilian and military sides. The defence sector in particular requires the development of modern computing capabilities.

According to the author, the development of artificial intelligence for military purposes is a current task for all countries. Computing skills are also up to date as there is a growing need for information. The author concludes from all this that the combination of the learning algorithms of artificial intelligence and the innovative computing capabilities provided by quantum informatics could be a significant weapon in the future.

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