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Prof. Dr. Faruk YİĞİT¹

Chairman of the Board of Directors | ROKETSAN INC.

Abstract

The trade wars and technological conflicts between countries that have emerged because of the globalization today play a key role in determining the balances in the world. In order to understand Roketsan's place and its direct and indirect contributions, it is essential to know the history and development process of the company in the National Technology Initiative, which was initiated with the vision of ensuring the technological and economic independence of our country and becoming a global power. In the first years of the Turkish Republic, a technology and industry move were initiated in Türkiye, but it could not be sustained. In the following years, technological dependence on foreign countries increased and its negative effects were clearly seen in the problems experienced in Cyprus in the 1960s and 1970s. After the Cyprus Peace Operation, necessary decisions were taken to establish an independent and national defense industry. Founded in 1988 to meet the rocket and missile needs of our country, Roketsan is one of the important fruits of these decisions. The understanding of catching up with the competitors who had started the technology race long ago, the nationalization of rocket and missile technologies controlled by international restrictions, as well as the development of innovative technologies has been an important part of Roketsan's corporate genes from the very beginning. In the light of the National Technology Initiative initiated for the technological and economic independence of our country at the beginning of the 2000s, Roketsan's development journey has also accelerated, and innovative technologies and successful products have been introduced as a result of these investments in technological infrastructure, knowledge and qualified human resources. With the effect of globalization, countries' becoming connected to each other in many dimensions has started a great change and transformation process in the world. However, the economic turmoil and inter-country trade wars triggered by the Covid-19 pandemic indicate that the world is entering a new era. Especially the bottlenecks in natural resources, the search for alternatives to hydrocarbon-based energy resources and the change in usage strategies, the risks of access to water and food resources, as well as the shrinkage or monopolization of critical raw material resources used in industries such as microelectronics industry, as global warming becomes more evident, causes tensions and conflicts in the global context, and can even lead to wars. In the future, in order to be ready for the effects that may arise in the event of the realization of these risks, and to manage the process effectively, Türkiye needs to create the necessary strategies and develop reflexes together with all its institutions. Roketsan, which is of critical importance for the security of our country's future, continues its studies on the technologies and systems of the future, whilst developing flexible and adaptable corporate processes and systematic reflexes that will increase its resilience against unexpected crises and events. We believe that these strategies and activities put forward by Roketsan are of critical importance in our country's technology move, both in military and civilian terms, will be of great benefit to many sectors, and beyond that, they will contribute to the social sense by increasing the self-confidence and technological awareness of our society.

Keywords

Technology, Defense Industry, National Technology Initiative, Globalization, Rocket and Missile, Global Risks

¹ fyigit[at]ssb.gov.tr | ORCID: 0000-0001-6189-8190

1. Introduction

The trade wars and technological conflicts between countries that have emerged because of globalization today play a key role in determining the balances in the world. In order to understand Roketsan's place and its direct and indirect contributions, it is essential to know the history and development process of the company in the National Technology Initiative, which was initiated with the vision of ensuring the technological and economic independence of our country and becoming a global power.

Looking at the recent history of Türkiye, it is seen that as a result of the initiatives generated by valued and visionary industrialists such as Nuri Demirağ, Vecihi Hürkuş, Nuri Killigil, Şakir Zümre in the field of defense and aviation, highly innovative products were created for the time, and even export opportunities began to emerge. In this process, on the one hand, pioneering steps were taken to train qualified technical human resources, and on the other hand, awareness in the society, especially about aviation, started to be created. These technology and industrial seeds, which were planted with great care at first, turned into bright saplings, but due to the lack of support, these seedlings withered before they could develop solid roots. In the following years, our country's dependence on foreign countries, both in civil and defense fields, increased, and the negative consequences of this situation, especially in the defense sector, emerged in the early 1960s. At the end of 1963, Turkish warplanes were sent to Cyprus in response to the Greek Cypriots' attacks on Turkish villages. Thereupon, the United States administration emphasized that the weapons given to Türkiye as official American aid cannot be used outside the NATO mission, and beyond that, they also stated that they would not be able to act with the NATO common defense principle in case of the intervention of the Soviet Union (Kıbaroğlu, 2017, p. 10). As Türkiye could not use its important military assets, it could not make a military intervention to protect the Turkish Cypriots; In addition, it has also started to question foreign dependency in terms of national security. In the following period, some measures were taken for the independence of military capabilities and certain preparations were made. By 1974, the problem in Cyprus had become a situation that needed to be intervened, and after all diplomatic negotiations were inconclusive, Türkiye started the Cyprus Peace Operation based on the provisions of the Guarantor Agreement. Despite the unfair embargoes of foreign countries, the operation was successfully completed and peace was achieved in Cyprus; On the other hand, the problems experienced due to foreign dependency were not forgotten and important steps were taken towards the establishment of a national and independent defense industry. Roketsan, one of the important fruits of this period, was established in 1988 with the mission of meeting the needs of our country in rocket and missile technologies.

Roketsan started its corporate journey with technology transfer (know-how) for subsystem production from abroad. In this period, the foundation of the company's technical infrastructure was formed, and the design approaches and standards of the West and the East were acquired, and then Roketsan formed its own unique design and development (know-why) character. Another important point in this period is the rapid increase in corporate knowledge and the acquisition of a university-industry cooperation approach because of collaborations with national universities and academics on rocket and missile technologies, where open knowledge is very limited in the global framework. In the light of these, system design capability has been gained and a core team with a strong technical knowledge has been created. On top of these solid foundations laid in the early stages of its establishment, Roketsan added broader engineering, production and testing capabilities

and started indigenous product development activities for the emerging needs of the Turkish Armed Forces. The core engineering team has successfully implemented product development processes with a system design approach, and these capabilities have been institutionalized and added into the “corporate memory”.

Roketsan’s development journey has accelerated in the light of the National Technology Initiative, which was initiated in the early 2000s for the technological and economic independence of our country. Being aware of the critical role of understanding the causality behind the technology, namely knowing how to produce a system or component in this process (know-how), Roketsan has increased its investments in technological knowledge and depth with the strong support of the government. In this context, utmost importance was attached to the academic and institutional development of the qualified human resource, which is the most valuable asset of our company. As a result of these investments made in both technological infrastructure and knowledge and qualified human resources, as innovative products and technologies are physically revealed and successful in the field, user confidence has increased and Roketsan has started to develop more competitive products with its own initiative and equity. The first examples of the fruits of this period have been innovative systems such as Smart Micro Munitions family (MAM-L, MAM-C, MAM-T), TEBER, L-UMTAS, TR-230 ballistic missiles, and ALKA Directed Energy Weapons.

Today, Roketsan has a wide spectrum of focus from under the seas to space; develops and offers unique products such as torpedo systems, naval cruise missiles, precision-guided tactical systems, ballistic systems, ballistic protection systems, air defense missiles, sounding rockets, satellite launch systems. In order to create these systems, it is necessary to master the details of subjects in many different disciplines such as guidance, control, navigation, sensor, software, propulsion, warhead, fuze, pyrotechnics, analysis-modelling-simulation, material technologies, and all to be managed with design and development processes in harmony. Roketsan, which extends deep roots with its human resources specialized in these fields, is the leading institution in its own sector in Türkiye, which does not refrain from making sacrifices and taking risks in order to meet the needs of our Armed Forces and develops its ecosystem by making room for other “saplings to grow in its shadow”. Also, in global markets, Roketsan cooperates where possible, competes with the leading competitors of the sector, raises its voice abroad and makes significant contributions to the high technology exports of our country. In order to ensure sustainability in this ascendant route, investments in future technologies continue increasingly in different fields such as space technologies, artificial intelligence and smart systems, advanced sensors and navigation technologies, directed energy systems, digital production, miniature technologies, hypersonic systems, and next generation materials.

Roketsan has come to a very effective position in terms of meeting Türkiye’s current rocket and missile needs in accordance with the mission given to it at its foundation. In addition, it designs next generation naval, land and air systems by “imagining” the battlefields of the future in order to respond to the future needs of our armed forces and even to offer game-changing solutions, and also plans the next generation production infrastructures that will produce these systems with high capacity. On the other hand, Roketsan plays a critical role in self-sufficient access to space, which has an important place in Türkiye’s future vision, and is rapidly working to create the required capabilities and capacity for this. Initiating a significant export move in the international arena, Roketsan develops and offers effective system solutions to meet the needs of stakeholders in friendly and allied countries abroad and aims to meet a significant share of its sales from exports by 2025.

Considering the total sales of defense industry companies in the world, the share of the civil sector in their total sales draws attention. It is seen that approximately 60% of 2021 sales of the largest 100 defense industry companies come from civil sector (Defense News Top 100, 2021). Recently, Roketsan has started important initiatives to meet the needs of our country, especially in civil areas, by transferring the advanced technologies it has developed to other sectors, and thus to create high added value.

2. Türkiye's Geopolitical Position and Future Outlook in the Light of Globalization

The world economy has entered a recovery process after the 2008 financial crisis, and with the effect of globalization, the economies of the countries have become more interconnected. On the other hand, technologies developing at a dizzying pace have begun to play a decisive role in all sectors. Additionally, trade wars between countries have reached serious dimensions and have changed the balance in the World, and in this context, the strategic importance and security of trade routes, supply chains, and energy resources and routes have increased even more. However, with the emergence of the Covid-19 pandemic at the beginning of 2020, the world balances were shaken once again. In addition to the increasing health crisis, social problems have also emerged and in order to manage this process countries have taken extraordinary measures in many areas, especially in the economy. During this period, technology has become the most important tool in the search for solutions for the exit from the pandemic. In this process, various vaccines were developed and put into use in a shorter time than expected, thanks to the high level of technological advancement in the world. In addition, innovative solutions combining technologies from different fields played a major role both in the fight against the pandemic in hospitals and in reducing or eliminating the health risks in the daily life of the society. An all-out industrial movement has been initiated in Türkiye to meet the urgent domestic need, and even reached a point that satisfy the exports demand (T.C. Sanayi ve Teknoloji Bakanlığı, 2020). One of the important issues in this process is the products that are created by combining technologies developed in different sectors. One of the success stories in this context is the development of artificial respiration devices, which were in great need in hospitals both in Türkiye and abroad at that time, by bringing together advanced technologies gained in the civil and defense industries and converting them into products in a very short period like 2 months, and then being able to move to mass production.

In general, when we look at the pre-pandemic period, globalization has brought economic growth and prosperity to countries. However, the Covid-19 pandemic process also showed the whole world how such unexpected events can negatively affect the global system, on the other hand, it showed that countries with industries built on technological developments gain great advantage and can get ahead commercially. This is an indication of how important the seeds planted within the scope of the national technology initiative are for the future of our country.

Another important change that has come to the fore in the Covid-19 pandemic process has been in human resources movements. Thanks to the opportunities provided by digital technologies, remote working has become widespread rapidly and institutions have moved their activities to the digital environment to a large extent. However, this situation accelerated the removal of physical borders and increased the tendency of qualified human resources to change jobs and even revealed a brain drain effect in a global context. The fact that the most valuable capital at the point of developing technology is qualified human

resources and technology-focused companies offer an international working environment has brought about the “globalization of brains” (Chamorro-Premuzic, 2020). In this context, well-trained and qualified human resources in Türkiye, especially in the defense industry, attract the attention of international companies. In this sense, it is of critical importance to further enrich the strategies implemented for the protection and then growth of qualified human resources, which is the most important building block of the national technology initiative that has been carried out for nearly a quarter of a century.

As we enter the third year of this challenging process, while the effects of the pandemic have eased, some paradigm shifts have been triggered in the global framework. The fragility of supply chains and the large-scale negative consequences of the interruptions in these areas have revealed the need for countries to develop different reflexes and related capacities. In the current situation, in contrast to the aspect of globalization, approaches such as nationalization and independence of industries, shortening or alternativization of supply chains have begun to be discussed (Shih, 2020). In this sense, it is considered that the nationalization-localization philosophy adopted by Türkiye will contribute positively to the upcoming process and establishing an appropriate balance between globalization and localization (nationalization-localization) approaches towards supply chains will offer significant advantages in global competition.

In the globalizing world, countries and especially economies being interconnected and even dependent on each other creates a worldwide sensitivity to large-scale and unexpected events, and the resulting effects can spread to the global dimension in a very short time. Considering the risk perceptions of countries for the coming period, global warming, energy, access to water resources, food (and agriculture), raw materials, new epidemics and large-scale human migrations that may arise as a result of these come to the fore (World Economic Forum, 2022). It is evaluated that the effects that may occur in the event of the realization of these or similar risks may further increase trade conflicts and even trigger hot wars. Despite the recent views that large-scale classical warfare will no longer be possible and that terrorism and asymmetric wars will become dominant, Russia-Ukraine war has shown that conventional wars between countries are still a possibility and a great threat. However, regardless of the type of military conflicts, technology has now become a critical factor that can change the course of wars. In the war between Azerbaijan and Armenia in 2020, the Unmanned Aerial Vehicles and MAM-L laser-guided ammunition and ballistic missiles produced by Türkiye significantly changed the course of the struggle and contributed greatly to the success of the Azerbaijani army. Similar situations also occur in the Russia-Ukraine war, and it shows that technology is a balancing factor against the numerical size of the armies.

Situations such as the armed forces are not strong enough and there is no developed national defense industry to support it, or its dependence on foreign countries create a serious risk for the existence of countries and create vulnerability against commercial or military pressures and threats from outside. A defense industry that has a solid base and produces advanced technologies not only plays an important role in strengthening the army, but also makes a significant contribution to the society’s acquaintance with high technology and raising awareness, and thus supports the increase of social self-confidence. With the development of the positive public sentiment, the phenomena of national unity and solidarity are increasing and clinching. In addition, the strength of the country and the creation of a safe environment contribute to the arrival of foreign investments and the development of the economy. Examples such as advanced missile systems, space

technologies, military aircraft, helicopters, ships, unmanned vehicles, and electric car initiatives, which have been put forward within the framework of Türkiye's national technology initiative, have significantly increased the national public awareness and interest in technology and made it a source of pride. In addition, the understanding that technology, which was largely identified with abroad in the past in our society, is no longer a concept that can only be purchased from abroad, and that technologies that can compete with abroad are now produced in our country, has started to become widespread. Roketsan, which produces high value-added technological products, and our other defense industry companies as the pioneers, have a great impact on this.

Türkiye is in a highly sensitive geopolitical position as it is a bridge connecting the continents of Asia and Europe, as well as being close to energy and other natural resources, which requires a strong economy, industrial infrastructure, and military capacity. It is extremely critical to ensure the security of energy resources, which are one of the important elements that feed the industry and the economy. The importance of the armed forces in protecting our rights and interests on potential energy resources in the Mediterranean and the Black Sea has recently been recognized once again. It is foreseen that the importance of access to energy resources will increase even more in the near future, and in this context, Roketsan expands its activities towards game-changing technologies and innovative systems in order to offer products that will deter potential threats and make a difference in the field when necessary.

3. Conclusion and Assessment

With the effect of globalization, countries' becoming connected to each other in many dimensions has started a great change and transformation process in the world. However, with the Covid-19 pandemic, a global health crisis has been experienced and its effects are still continuing, albeit having been alleviated recently. The economic turmoil triggered by this situation and the trade wars between countries indicate that the world is entering a new era. Especially the bottlenecks in natural resources, the search for alternatives to hydrocarbon-based energy resources and the change in usage strategies, the risks of access to water and food resources, as well as the shrinkage or monopolization of critical raw material resources used in industries such as microelectronics industry, as global warming becomes more evident, causes tensions and conflicts in the global context, and can even lead to wars.

In the future, in order to be ready for the effects that may arise in the event of the realization of these risks, and to manage the process effectively, Türkiye needs to create the necessary strategies and develop reflexes together with all its institutions. With the national technology initiative in the early 2000s, a change-transformation in the industry was triggered, and the awareness of technology and public support for it increased in the Turkish society. In this context, especially when looking at the transformation in the defense industry, the general maturity level, which was mainly at the level of system integration in the 2000s, has now reached a point where it can design its own unique and innovative platforms and systems and develop the technologies of the future. The fruit of this success is seen with Türkiye rising to 12th largest global arms exporter as of now, from 28th place in 2002 (Wezeman, Kuimova, & Wezeman, 2022).

Roketsan, which is of critical importance for the security of our country's future, continues its studies on the technologies and systems of the future, whilst developing flexible and adaptable corporate processes and systematic reflexes that will increase its resilience against

unexpected crises and events. Steps are taken to develop the ecosystem in which it is located and to increase strong stakeholders and solution partners within this framework. Special development plans are made in order to prepare the current qualified human resources, which is Roketsan's greatest asset, for the conditions of the future and to equip them with the necessary skills and knowledge; In addition, effective collaborations are established with academic institutions in order to win and educate bright young people who may join the Roketsan family.

While the distinction and boundaries between sectors and applications were more pronounced in the past, these boundaries are now disappearing, and the resulting inter-sectoral pass-through increases innovation and enables more competitive products to be created. It is foreseen that this will become much more effective in the future, and that institutions that cannot achieve this will be left behind in the competition. In this context, it is of great importance to ensure the transition and sharing of technology by establishing more effective bridges between the defense and the civil sectors in Türkiye. In our view, the advanced technologies developed by Roketsan can find a response in fields such as green energy, automotive and civil aviation, and studies are continuing in this direction.

We believe that these strategies and activities put forward by Roketsan are of critical importance in our country's technology move, both in military and civilian terms, will be of great benefit to many sectors, and beyond that, they will contribute to the social sense by increasing the self-confidence and technological awareness of our society.

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About Author

**Prof. Dr. Faruk YİĞİT | ROKETSAN INC. Chairman of the Board of Directors |
fyigit [at]ssb.gov.tr | ORCID: 0000-0001-6189-8190**

Dr. Faruk Yigit graduated from the Department of Mechanical Engineering at Istanbul Technical University, Istanbul in 1984. He received his MSc. Degree in the area of Mechanical Engineering at Yildiz Technical University in Istanbul. Later, he obtained his MSc. Degree in the area of Applied Mechanics and PhD. Degree in the area of Mechanical Engineering at the University of Michigan, Ann Arbor, USA. Dr. Yigit worked at Yildiz Technical University in Istanbul and King Saud University in Riyadh as an Assistant, Associate, and a Full Professor. Dr. Yigit returned to Yildiz Technical University in 2009 and served as the Chairman of the Department of Mechatronics Engineering, as the Dean of Graduate School for Natural and Applied Sciences, as the Dean of College of Mechanical Engineering, and as the Vice Rector. He has been working as the Vice President of Presidency of Turkish Defense Industries since 2018. He also serves as Chairman of the Board of Directors of Roketsan Inc.