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IN THE CONTEXT OF  
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### Abstract

The defence industry has pioneered technological developments throughout Turkish history, as in all other nations. The Turkish states was in leading and decisive positions both in regional and international arena during the periods when their defence technology was superior. However, during the periods when their defence technology began to decline, they experienced difficulties caused by foreign dependency in this field. 15<sup>th</sup> and 16<sup>th</sup> centuries, defined as the Rising Period of the Ottoman Empire can be an example in this regard. In this period, the Ottoman Empire developed its military capabilities by itself to a large extent and became an empire that spread over three continents. The opposite was observed during the periods of stagnation and regression. The founding cadres, who emerged victorious from the War of Independence and founded the Republic of Türkiye, made great investments in the field of defense industry, as they did in every field, together with the Republican period. These investments led to the establishment of deep-rooted institutions that form the basis of the civil and defence industry in all areas of the country. After the Second World War, with the close military cooperation with the United States of America (USA), some defense industry institutions were closed and foreign dependency in the arms industry increased. While this situation brought a heavy burden to Türkiye's economy, it also prevented it from taking steps towards its national interests in the international arena. The arms embargo imposed on Türkiye by the USA after the 1974 Cyprus Peace Operation once again revealed the importance of possessing domestic and national technology. Since the 1990s, some states, using Türkiye's fight against terrorism as an excuse, have imposed restrictions on the sale of arms and ammunition to Türkiye from time to time. Established in the 1980s following the end of the embargoes, Turkish defence industry organisations first started to manufacture licensed parts and then national and original products/platforms after the 2000s. These products met the military and strategic needs of the Turkish Armed Forces, and they have also positively contributed to international relations through export to friendly and allied countries.

This study explores the processes and developments in Turkish defence industry, which is the source and core of the national technology initiative, from the pre-Republican era to the present, with a focus on their effects on Türkiye's international relations.

### Keywords

*National technology initiative, Defence industry, International relations, Technology, National defence*

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## 1. Introduction

In terms of technology and industry, there is no doubt that defence technology is the first thing that has come to the fore since the first civilizations. From an opposite perspective, the survival instinct has given rise to wars because of the necessity of meeting essential needs such as nutrition and shelter. Today, states have defence ministries or countries develop defence technologies. In fact, this concept is not so different from the war technologies known in the past. As societies modernised, the expression “war” has been replaced with “defence”.

From the past to the present, from production technology, customer electronics, management information systems to end-user products, every technology invented or discovered so far was directly correlated with defence needs. The technology first serves the military needs, then the companies and organisations that develop it convert this technology to the base for civilian-commercial use. In this regard, the supply-demand balance becomes sustainable. This section will basically contain a defense industry-oriented narrative. In the following sections, the relationship between these two concepts will be shown by including civil-commercial enterprises.

## 2. An Overview of the Pre-Republican Era

Today, the area surrounded by the borders of the Republic of Türkiye has been called Anatolia, Proto-Asia, Asia Minor etc. throughout the history. In time, these lands were raided by Turkic people such as Scythians, Avars, Oghuz Turks, and eventually Turks have permanently settled here in 1071. In the context of technological movements that took place in Türkiye, it could be useful to explore the Republican period starting from the pre-Republican periods.

Although the position and place of Turkish culture, cuisine and literature in the world is arguable, the place of the Turkish defence industry is certainly undisputed since it has shaped history in many aspects including, Mete Han’s army order, using horses as carriers due to their manoeuvrability skills and their speed in reaching the battlefield, employing a light navy due to the Balkans’ harsh geographical conditions, the Hungarian designed cannons used to break through the Theodosian Walls, galleons hauled to the ridges of Istanbul, and Tatar arrows.

Most naturally, societies enter periods of stagnation and regression just like they rise and prosper. In this regard, Ibn Khaldun claims that “*States, as human beings are born, grow up, and die*” (Yücel, 1997). Among the leading factors that cause this process are the importance attached to science and industry and the societies success in producing rational policies. Having a culture that thrives on science would minimise the difficulty in adapting to new conditions when current conditions change.

Even though the Ottoman Empire wanted to closely follow the scientific and technological developments in Europe during periods of stagnation and regression, the improvement efforts did not yield the desired results. Among the improvements made in the aforementioned periods, we notice the industrial organisations built for military purposes, which are Mühendishane-i Bahr-i Hümayun (The Imperial School of Naval Engineering) established in 1773 to train engineers in the maritime field, Mühendishane-i Berr-i Hümayun (The Imperial School of Military Engineering) established in 1793 to train artillery officers. Also, Beykoz Paper Factory, Feshane, Tophane Casting Factory, and

Dolmabahçe Rifle Factory can be mentioned among the following developments. A century later, between the years 1834 and 1923, Tersane-i Amire (The Imperial Shipyard) was built in 1834, followed by Baruthane-i Amire (the Imperial Gunpowder Factory) in 1836 and Bahriye Sanayi Alayları (Naval Industry Regiments) in 1858 due to the fact the previous improvement efforts have not been as adequate as they should have been. Although these initiatives aimed to bring European knowledge and know-how to the Ottoman Empire, they could not go beyond a mere technology transfer and remained insufficient for permanent development.

### **3. Republican Era**

The Turkish Republic was marked by radical reforms in the field of industry as well as in every field, with efforts to revolutionise its perspective on science and technology. The process, which was originally initiated as technology transfer from abroad, in time developed into research and investments in technology in Türkiye. State's involvement to pioneer and support such efforts has been seen as one of the most basic requirements of development. In this context, the importance of domestic and national production was truly embraced after the bitter experiences of the past, and the young Republic aimed to achieve national development by focusing on this matter as a whole. The big progress that the Turkish industry made in such a short time is quite remarkable despite the devastating global economic crises experienced in the same years and the problems they caused in Türkiye's economic balance. Another remarkable effort in these years is that the state tried to make investments in all strategically important spots of the country, not in northwest Anatolia alone, unlike in the following years. A significant part of these investments were government investments or public partnerships, however, private enterprises, which have been a few in number but quite important for Turkish Industry considering their impact, were also launched. Four entrepreneurs, Şakir Zümre, Nuri Killigil, Nuri Demirağ and Vecihi Hürkuş, who hold a special place in Türkiye's aviation and the arms industry, contributed to the establishment of a modern economic structure in this period, on the axis of statism. The developments mentioned could actually be considered a courageous step towards industrialization. As stated above, these developments could not go beyond technology transfer-centered endeavours, and the development of national science and technology mostly flourished after 1960.

Right after the end of the War of Independence, the Izmir Economy Congress was held in 1923 in the newly established Republic to speedily heal the wounds of the long wars and the occupation of Anatolia. The aim was to transform Türkiye, a predominantly agricultural state in the early years of the Republic, into an industrial and commercial state by reviving trade, accelerating foreign fund inflow, and ensuring rapid industrialization, and while doing this, making modern agriculture a tool for the development of the industry. The Incentive Law was introduced to support the manufacturing industry, which has made great progress in the first ten years of the Republic. In the process, Zonguldak Maden ve Mühendis Mektebi (Zonguldak Mining and Engineering School) was established in 1924, Kayseri Tayyare Fabrikası (Kayseri Airplane Factory) in 1925, and Ankara Çimento Fabrikası (Ankara Cement Factory) in 1926. Meanwhile, by importing technology, the sugar factories of Alpullu and Uşak (1926) and the cement factories of Zeytinburnu-Arslan and Kartal-Yunus (1929) have been established to produce two basic products in these lands. The period between the years of 1933 and 1939 also deserves a special focus, since during this period, weaving, which comprises a significant part of the worker pool in the country, was given to the state manufacturing industry by Law No. 2262 enacted on 11

June 1933. The industrial flourishing continued with the launch of Niğde Bor Yarn Factory (1935), İzmit Paper Factory (SEKA-1936), Ereğli Cotton and Nazilli Chintz (1937) factories, Merinos Wool Industry and Gemlik Artificial Silk and Viscose Factories (1938), as well as Malatya Cotton Industry (1939). Heavy industry facilities established also during this period include the steel factory (1932) operating under the Kırıkkale General Office of Military Factories and the Karabük Iron and Steel Factory (1937) (Special Expertise Commission Report, 2007).

Besides the new attempts made in the civilian field, great steps were also taken in the field of defence, although they varied depending on the conjuncture. Askeri Fabrikalar Genel Müdürlüğü (General Directorate of Military Factories), Ankara Light Weapons and Cannon Repair Shop (1924), Yeni Mühimmat Fabrikası (New Ammunition Factory) (1927), Kırıkkale Power Plant (1931), Gunpowder, Rifle, Cannon Factories (1936) were among the institutions established by the state in this period, followed by the ammunition factory (1925) established by Şakir Zümre and the gun and gunpowder factories (1930) established by Nuri Killigil as private enterprises. As for the civil aviation efforts, Vecihi Hürkuş opened his own workshop (1931) and manufactured an aerial vehicle he called 'Vecihi-XIV'. In defence aviation, TOMTAŞ (1926) and Nuri Demirağ started Türkiye's first and largest private sector initiative (1936) by building an aircraft factory where 24 trainer aircraft and six-seat passenger aircraft were manufactured.

The tensions arising from the revisionism of Germany and Italy had been increasing the threat of a new war in Europe in the second half of the 1930s. During this period, Türkiye has started to focus more on improving its defence industry. Etimesgut Aircraft Factory (1939) and Gazi Aircraft Engine Factory (1941) were founded to manufacture training and transport aircraft. About four years later, an aircraft engine factory was established in Ankara (1945), aimed to produce domestic technology as well. Although some of these initiatives have been started with foreign partnerships, the fact that some of the products manufactured in these factories have been exported abroad tells us how much progress has been made in such a short span of time. Another aviation project that was launched during this period was the Ankara Wind Tunnel (ART). The tunnel, which took three years to build, became operational in 1950 and was the largest wind tunnel in Europe at that time (Göker, 2004).

#### **4. Technological Developments From 1950 to 1974 and Their Impact on International Relations**

The discoveries and inventions, which were used especially in the military field during the World War II, developed the infrastructure of scientific and technological advancements that are still in use today. So as to solve the problems brought by the war, the main actors of the international system placed greater focus on research and development between the years of 1940 and 1950 and, engaged in new technological investments. The United States of America (USA), the most powerful country in terms of investment in science and technology after the World War II, undertook numerous projects in the fields of defence, aviation, and space with government incentives because of their competition with the Union of Soviet Socialist Republics (USSR).

As part of its Manhattan Project, the United States allocated great amounts of funding for research and development activities from 1940 to 1950 to develop nuclear technology. In the process of nuclear technology research, plenty of inventions for civilian use have also been created. The technological advances in semiconductor, computer and aircraft sectors

emerged during those years (Alptekin, 2006). Especially in terms of defence industry, it can be seen that mechanized weapons have been replaced by turbo jet engines, missiles, electronics, and advanced material technologies in the new world (Özlu, 2019).

The Truman Doctrine, which was announced to Congress in 1947, and envisaged providing financial aid to Greece and Türkiye to help them sustain their economies and militaries, has been a downward shift for the Turkish defence industry. Because the Truman Doctrine has been the start of a process in which Türkiye was forced to depend on military material aid from the United States and to buy more from Americans in lieu of developing its proper defence industry. The Marshall Plan, which was enacted almost simultaneously with the Truman Doctrine, required Türkiye to concentrate its investments on agriculture, mining and highways, largely stopping the establishment of heavy industry facilities, including the defence industry. As Türkiye's military integration with the West grew further, its dependency on foreign defence equipment grew at the same pace. Having become a member of NATO in 1952, Türkiye was granted defence equipment from the member states, especially the United States. Due to the increasing foreign aid, the progress of the defence industry has slowed down, military factories have become economically problematic for the national budget, and these problems have turned into obstacles to the overall technological development (Alptekin, 2006).

Military factories and facilities were allocated to the Mechanical and Chemical Industry Corporation (MKEK), established by the State in 1950. These were: Kırıkkale Steel and Brass Factories for material manufacturing; Kırıkkale Cannon and Rifle Factories, Ankara Weapon and Carpentry Factories, Mamak Mask Factory for machinery manufacturing; Kırıkkale Ammunition Factory, Ankara Cartridge Factory, Silahtarağa Hunting Cartridge Factory to meet ammunition needs; Kırıkkale Gunpowder Factory, Elmadağ Gunpowder Factory, Bakırköy Gunpowder Factory, Konya Güherçile Smelter manufacturing chemicals manufacturing, and Kırıkkale Power Centre to produce electricity. Although military factories were established utilizing the most modern technology, they became unable to follow technological advances over time. It should be noted that even the newest factories were 12-15 years old when the MKEK was established (Özlu, 2019). The aircraft engine and aircraft factories of the Turkish Aeronautical Association were transferred to the MKEK as a result of their inefficient operation. Due to an unsatisfactory number of orders for aircraft manufacturing, the factories started to manufacture other types of machinery that required high production technology but eventually were converted into a textile factory in 1968 (Alptekin, 2006; Özlu, 2019). Doubling its initial sales volume of almost 30 million in three years after its establishment, the MKEK was the first corporation in Türkiye to manufacture and export aircraft, as well as steel sheet products, railway rails, steel drawn pipes, machine tools and boxes of textile machines (Özlu, 2019).

The Military Assistance Agreement signed with the United States in July 1947 under the Truman Doctrine granted Türkiye a highly limited use of materials and equipment provided by the U.S. With these limitations, the building up of the State Defence Industry slowed down and original technology production was utterly neglected (History of Turkish Defence Industry Agency, 2022, Ziyilan, 2001).

With the Marshall Plan, the United States provided around \$13 billion of aid to the Western European economies. Türkiye received 184.5 million dollars of aid and increased its production volume, especially in agriculture (Erhan, 2006). However, this American initiative's impact on the Turkish defence industry has been rather detrimental. The

military aid, grants, and foreign purchases that grew with Türkiye's NATO membership have caused the Turkish Defence Industry to come to a standstill (Acun, 2021).

To advance economic cooperation and develop trade in the world, the Organization for Economic Cooperation and Development (OECD) was established in 1961, followed by the launch of the Pilot Teams Project (Science and Economic Development) in 1962, in which Türkiye too was involved as a member. The main aim of the project was: "The project was implemented as part of the OECD's Scientific Research Committee and Scientific Affairs Office's idea that 'scientific activities are an important factor in economic growth. These activities should therefore be a part of a national policy, as in other areas of economic and social life, and its intensive efforts to develop and disseminate this idea.'" (Acun, 2021). The Türkiye report was prepared under the leadership of Professor Erdal İnönü and published in 1967, however, it remained ineffective to help Türkiye establish a proper science policy (Acun, 2021).

The Scientific and Technical Research Council of Türkiye (TÜBİTAK) was established in 1963 with a mission "To organise basic and applied research activities in natural sciences and to ensure cooperation among them" (First Five-Year Development Plan, 1963-1967) and to conduct activities in the field of science and technology (Göker, 2004).

The Oil Crisis which began after the 1973 Arab-Israeli War, or the Fourth Arab-Israeli War revealed for the first time the need for the world to seek and develop alternative energy sources (Alptekin, 2006). Turkish private sector was encouraged to build hydropower and thermal power plants. The construction of the Keban Hydropower Plant started in 1965, finally beginning to operate in 1974 with an installed power of 1330 MW and an annual production capacity of 6000 GWh (Erol, 2007).

The table below lists the defence industry organisations established from 1952 to 1980 in Türkiye, in addition to the industrial and technological developments outlined above (Demir, 2020).

**Table 1.** Defence Industry Organisations Established in 1952-1980 (Seren, 2019 reported by Demir, 2020).

<b>1950</b>	Makine ve Kimya Endüstrisi Corporation (MKE)
<b>1952</b>	İbrahim Örs Casting Industry and Trade Inc.
<b>1954</b>	Ministry of National Defence R&D Department
<b>1957</b>	Ammunition Factory
<b>1963</b>	OTOKAR
<b>1964</b>	BMC Industry and Trade Inc.
<b>1967</b>	Otomarsan, Northern Electronic Telecommunication Inc. (NETAŞ)
<b>1969</b>	Kalekalıp Mould Industry Inc., Meteksan Sistem
<b>1970</b>	Turkish Air Force Support Foundation
<b>1972</b>	TÜBİTAK- Defence Industry Research and Development Institute (SAGE)
<b>1973</b>	Turkish Naval Foundation
<b>1974</b>	TUSAŞ; HEMA Gear Industry and Trade Inc., Turkish Land Force Support Foundation, Asil Çelik Industry and Trade Inc.
<b>1975</b>	ASELSAN
<b>1978</b>	ASMAŞ
<b>1979</b>	Barış Electrical Industry Inc., İşbir Electrical Industry Inc.



## **5. Technological Developments in Turkish Defence Industry from 1974 to 2000**

Located in the Eastern Mediterranean, the island of Cyprus has had great strategic importance throughout history due to its geographical position. Following its conquest by the Ottoman Empire in 1571, its ownership remained with the Ottoman Empire with the 1878 Treaty of San Stefano, but its administration was transferred to the British. Under the Treaty of Lausanne (1923), the island was lost to the British Empire. The biggest dream of the Greeks Cypriots was a union of Cyprus with Greece, called Enosis, which led, after the 1930s, to major conflicts between the Greeks and Turks living on the island. On 16 August 1960, the Treaty of Guarantee between Cyprus, Greece, Türkiye, and the United Kingdom established the independent Republic of Cyprus, hence the British sovereignty on the island came to an end, however, the problems between the Cypriot Turks and Cypriot Greeks continued. On 15 July 1974, the Greek Junta in Athens and EOKA-B members perpetrated a coup against the Greek Cypriot leader Makarios III, to establish a much-desired Cyprus-Greece union, referred to as Enosis. Following these events, Türkiye, as the Guarantor State under the London and Zürich Agreements, ordered its forces to land on the island on 20 July and 14 August 1974, and take control of the northern part of the island (Yılmaz, 2017).

The 20 July 1974 Peace Operation in Cyprus had significant political, economic, social, and industrial consequences. Among these consequences include the U.S. Congress's decision to impose an arms embargo on Türkiye in 1975. In response, in May 1975, Türkiye unilaterally terminated the Defence Cooperation Agreement it had signed with the United States in 1969, and also brought under control the activities carried out with the U.S. in the joint facilities, except for İncirlik (Yılmaz, 2017).

The U.S. arms embargo lasted until 1978, and Türkiye's foreign dependence became even more problematic in terms of military technology, after the Truman Doctrine and Marshall Plan. Along with the Turkish Air Force Support Foundation, established in 1970 before the U.S. embargo, and the Turkish Naval Force Support Foundation in 1972, the Turkish Land Force Support Foundation was created through the donations made by the Turkish people on 27 August 1974, following the end of the arms embargo, with the motto "Make Your Own Tank, Your Own Weapon". These three foundations, which had been of utmost importance in terms of enhancing the Turkish Defence Industry, were later merged in 1987 and named "Turkish Armed Forces Foundation (TSKGV)" under Law No. 3388 (Yalçın, 2020).

TSKGV, as the main shareholder of organisations such as TAI-TUSAŞ, TEI, ASELSAN, HAVELSAN, and ROKETSAN, which are the major players in the Turkish defence industry, contributed greatly to the modernisation of the Turkish Armed Forces and the production of original weapon systems as part of the national technology initiative.

On 15 May 1984, Turkish Aerospace was established as a Turkish-U.S. joint investment company in Ankara's Akıncı for the design, development, manufacture, integration, modernisation, and sale of manned and unmanned aerial platforms by the Turkish Commercial Code and the Foreign Capital Incentive Law. F-16 aircraft were produced and assembled in this facility, and the fleets of the Turkish Air Force were upgraded with the fourth-generation combat aircraft. In the four-phase project, a total of 308 F-16s were produced, 46 of them for the Egyptian Air Force on behalf of the United States (Yalçın, 2020). In 2005, TAI and TUSAŞ were merged under TAI-TUSAŞ (Turkish Aerospace Industries Inc.-TAI) following the purchase of Turkish Aerospace's foreign shares

(Lockheed Martin of Türkiye, Inc. 42%, General Electric International, Inc. 7%) by national shareholders (Yalçın, 2008).

Turkish Aerospace Industries Inc. has established commercial relations with numerous countries to keep up with technological developments. These countries and companies include The United States; BAE Systems Controls, Inc., Boeing, LMAC, LMMFC, Marsh Aviation, MDHI, Northrop Grumman, Sikorsky, France; Airbus Military S.L., Thales, France-Germany; EADS-Eurocopter, Germany; EADS-Deutschland GmbH, Austria; FACC, Italy; Agusta, Belgium; Sonaca, Spain, Airbus- Spain, EADS-CASA, Netherlands; Koolhaas Alphen, the Republic of Korea; KAI, Canada; Davis Engineering, Greece; HAI, Egypt; Egyptian Air Force, Pakistan; Pakistan Air Force, Indonesia; IAe (Yalçın, 2008).

Besides the F-16 aircraft, TAI also manufactured SF260D beginner trainer aircraft, CASA CN-235 light transport aircraft, CN-235 maritime patrol and reconnaissance aircraft, and Cougar AS-532 utility helicopters. A partner of Airbus Military S.L. for the A400M project referred to as the Large Transport Aircraft of the Future, TAI will be the sole designer and supplier of various parts and components for the A400M aircraft. Another project in which TAI is involved as an international partner is the F-35 JSF fifth generation fighter aircraft project. Türkiye was included in the project in 2002, initiated by the U.S. in 1995, but as of 2020, it was excluded from the project following a disagreement with the United States due to the purchase of the Russian-made S-400 missile defence systems.

Today TAI is developing fully original platforms for the national technology initiative using the experience, knowledge, and know-how it gained from the abovementioned projects. Developed mostly during the 2000s, these systems include TAI TF-X (Turkish Fighter X), TAI Anka UAV, TAI Aksungur UAV, HÜRKUŞ, basic and primary trainer aircraft, HÜRJET light attack aircraft, TAI T625 Gökbey transport/utility helicopter, TAI/AgustaWestland T129 ATAK multi-role, all-weather attack helicopter, T-70 multi-role utility helicopter, and Göktürk 1-2-3 Satellites. These nationally made systems have both met the needs of the Turkish Armed Forces and also become important parameters in international relations by being exported to friendly and allied countries.

In 1985, TEI Engine Factory was launched in Eskişehir to produce engines for F-16 aircraft. TEI was a partnership of General Electric and the Turkish Air Force, with the majority of its shares owned by the Turkish Armed Forces Foundation. In addition to the production and assembly of components for F-16 aircraft engines, TEI also makes parts for other aircraft engines and offers maintenance services. The experience and knowledge gained in the process enable TEI to create and manufacture original engine designs (TEI, 2022).

ASELSAN was established in 1975 as a joint stock corporation affiliated with the Turkish Armed Forces Foundation (TSKGV) to cater to the communication needs of the Turkish Armed Forces after the end of the arms embargo imposed on Türkiye. As Türkiye's leader in defence electronics technology, ASELSAN's strong infrastructure is fully capable of meeting national needs (Turkish Armed Forces in particular) and international demand in the field of civil and military technology, communication and information technology, electro-optics, avionics, command and control systems, unmanned systems, radar and electronic warfare, land, naval and weapon systems, air defence and missile systems, transportation, security, traffic, automation and healthcare technologies. ASELSAN's engagement in the production and export of original products and its close focus on the

latest technological advances put the corporation among the largest global defence companies shaping militaries throughout the world (Top 100 - Defence News). Having built different cooperation models with other local organisations and institutions in Türkiye, ASELSAN is a major actor in international markets, a global brand that establishes partnerships, and makes global investments (ASELSAN, 2022).

Rocket and missile systems are critical systems controlled by the producing countries in accordance with international restrictions, therefore, using national technologies to develop rocket and missile systems is of utmost importance for national defence. ROKETSAN was established in 1988 with the mission of designing, developing, and producing rocket and missile systems hence addressing national defence needs. ROKETSAN, whose majority of its shares are owned by the Turkish Armed Forces Foundation, contributes substantially to Türkiye's defence industry by supplying rockets and missiles for land, navy, and airborne applications. Nations that own rocket and missile systems can use this capability as a deterrent factor in their relations with other nations and become a determinative parameter in international relations (ROKETSAN, 2022).

HAVELSAN was established by the Turkish Armed Forces Foundation in 1982 to meet the software and simulation needs of information and weapon systems used by the Turkish Armed Forces. HAVELSAN, which has made exceptional progress since its establishment in the fields of Command, Control and Defence Technologies, Training and Simulation Technologies, Information and Communication Technologies, Homeland Security and Cybersecurity Solutions, provides nationally made technological products, systems, and solutions primarily to the Turkish Armed Forces (TAF), public and private sector organisations and also exports those to international customers (HAVELSAN, 2022).

A great number of aid campaigns have been held for the reinforcement of national defence in different periods, and Turkish citizens have always and gladly contributed to these campaigns as much as they could. ASPİLSAN is one of the corporations founded in 1981 through donations by our citizens from Kayseri. Launched to meet the Turkish Armed Forces' rechargeable nickel-cadmium battery needs, ASPİLSAN has made great progress in producing national technology in the last forty years, increasing its product range to over 150 pieces. Today, ASPİLSAN is a strong defence industry company, able to produce energy storage systems for all types of civil and military handheld/manpack radios, war equipment, aircraft, and helicopters (ASPİLSAN, 2022).

Table 2 below provides a list of defence industry organisations established from 1980 to 1990 in Türkiye, in addition to the companies founded in line with the National Technology Initiative mentioned above (Demir, 2020).

**Table 2.** *Defence Industry Organisations Established in 1980-1990 (Seren, 2019 reported by Demir, 2020)*

<b>1981</b>	ASPILSAN
<b>1982</b>	HAVELSAN
<b>1983</b>	General Directorate of Defence Equipment Enterprises
<b>1984</b>	TUSAŞ Aerospace Industries Inc., Aksa Machinery Industry Inc., ETA Electronic Design Industry and Trade Inc.
<b>1985</b>	Defence Industry Development and Support Administration, TUSAŞ Engine Industry Inc.
<b>1986</b>	MAN Truck and Bus Industry Trade Inc., STFA Savronik Electronics Industry and Trade Inc.
<b>1987</b>	Turkish Armed Forces Foundation, MIKES-Microwave Electronic Systems Industry and Trade Inc., FMC-NUROL Defence Industry Inc. (FNSS)
<b>1988</b>	ROKETSAN, TRANSVARO Electronic Appliances Industry and Trade Inc.
<b>1989</b>	The Undersecretariat for Defence Industries (SSM), MARCONI Communication Inc., GATE Elektronik
<b>1990</b>	Aydın Software and Electronics Industry and Trade Inc.(AYESAŞ), HAVELSAN Technology Radar, Motor Turbine Industry and Trade Inc.
<b>1991</b>	ESDAŞ Electronic Systems Support Industry and Trade Inc.
<b>1992</b>	Savunma Teknolojileri Mühendislik ve Ticaret Inc. (STM), Nurol Machinery & Industry Co. Inc.
<b>1993</b>	TİSAŞ Trabzon Weapon Industry Inc.
<b>1994</b>	GİRSAN firearm manufacturing company
<b>1997</b>	RMK Marine
<b>1998</b>	HAVELSAN EHSIM Electronic Warfare Systems Engineering Trade Inc.

## 6. National Technology Initiatives After 2000

The above-stated defence industry organisations have made a major leap forward in terms of national technology production and its export abroad after the 2000s. Turkish Defence Industry carried out only 66 defence projects in 2002 with a foreign dependency ratio of nearly 80%, while today the number of projects has grown by 12-times and reached 793, with over 65% ratio of nationally produced parts, components, and final products (Turkish Defence Industry Agency, 2022).

Besides these defence industry companies, Baykar Makina has been operating in the defence industry since the 2000s, producing high-tech unmanned aerial vehicles and components, and developing national and original electronic products and software systems. Baykar Makina has created Bayraktar Mini Unmanned Aerial Vehicle (UAV), Malazgirt rotary wing mini-UAV, Tactical UAV, Bayraktar TB2, and Bayraktar Akıncı (UCAV). The company furthermore produces map and navigational modules and UAV management surveillance systems for ground control stations, operations centre, and image transfer centres. Avionics and subsystems, hardware cycle simulation systems, training simulators, and network-centred software are among Baykar Makina's other manufactures. Baykar Makina has individually developed and produced payload systems as well as in partnership with ASELSAN, ROKETSAN, and TÜBİTAK. It supplies 93% Turkish-made high-tech unmanned aerial vehicles to the Turkish Armed Forces and abroad, especially to Qatar, Ukraine, Azerbaijan, and Poland. Baykar Makina has become the export champion in defence and aerospace industry in 2021 (BAYKAR, 2022).

After the 2000s, Turkish defence industry made a great breakthrough in order to meet the needs of the Naval Forces Command. The chief pillar of this breakthrough was the National Ship (MİLGEM) Project, as part of which, domestic and national corvette type warships have been designed and built under the coordination of the Turkish Defence Industry

Agency (SSB) in historic shipyards, which still preserve their shipbuilding capability since the Ottoman period. With a domestic production rate of up to 70%, the project has so far yielded 4 Ada Class corvettes, which were allocated the Naval Forces Command from 2011 to 2019. Based on the MİLGEM platform, Türkiye's first Intelligence, Test and Training ship, TCG Ufuk, was put into commission in 2022. As a follow up to the MİLGEM, a new project is currently underway to build a Stackable Frigate and four additional ships. The MİLGEM Project attracted international attention and a deal was signed with Pakistan for the PN MİLGEM Project involving the construction of four ships. The experience gained through the MİLGEM project stimulated the beginning of the ANADOLU Multi-Purpose Amphibious Assault Ship Project, which will be capable of transporting one amphibious battalion as well as the necessary combat and support vehicles such as heavy helicopters and UAVs. The construction of a new national submarine is also underway with the New Type Submarine Project. These projects will ensure that Türkiye's seas will be largely defended by nationally produced platforms and weapon systems, simultaneously increasing cooperation with friendly and allied countries.

In 2018, five corporations have come together under the coordination of the Ministry of Industry and Technology to form Türkiye's Automobile Joint Venture Group Inc. (Togg) to produce Türkiye's first national fully electric vehicle, hence fulfilling the country's long-time desire to mass produce its own cars and create its own car brand since the interruption of the first domestically produced car projects, "Devrim" and "Anadol". In accordance with the national technology initiative, Togg is planning to produce electric cars with autonomous driving features, and entirely domestic and national commercial and industrial rights. Having set its sights to produce more than a car, Togg also works on vehicle-to-cloud connectivity intending to climb up to a top position in the national and international automotive industry (Togg, 2022).

First held in 2018, the Aviation, Space and Technology Festival-TEKNOFEST, is the world's largest festival in these fields organised in partnership with the Turkish Technology Team Foundation, the Turkish Ministry of Industry and Technology, as well as public and private institutions and organisations that work for the development of national technology. The first edition of the festival took place at Istanbul Airport in 2018. Before the pandemic, TEKNOFEST 2019 made its mark as the world's largest technology festival. TEKNOFEST hosts various competitions in different categories for primary, secondary, and high school students, associate, undergraduate, and graduate degree holders, and private sector enterprises. The competitions are designed and held together with stakeholders who are specialised in their subject areas. Primary and secondary-school level competitions include the categories of intelligent transportation systems, educational technology, software technology, Turkish language processing, technology benefiting humanity, robotics, and accessible living technology, while the categories in high school-level competitions are biotechnology, software, vehicle simulation, polar studies, electric vehicle, unmanned vehicles, autonomous vehicles, robotics, digital technologies, artificial intelligence in healthcare, entrepreneurship, agricultural technology, tourism technology, flying cars, climate change, environmental and energy technology. In associate, undergraduate and graduate-level competitions, the categories comprise initiative programmes, integrated circuit design, usually called chip design, hyperloop development, helicopter design, jet engine design, satellite model, agricultural vehicles, vertical landing rocket, and student research projects. These competitions have created a great sense of public awareness about science, technology, and aviation in Türkiye. Students who have taken part in these competitions will play a critical role in shaping Türkiye's national

technology initiative. Turkish Academy of Sciences (TÜBA) doctoral science awards are also administered by TEKNOFEST (TEKNOFEST, 2022).

## 7. Conclusion

The economic and political centre of gravity of world has shifted over the time. Among the key factors causing this shift is the importance that societies attach to scientific research. Therefore, classifying a society as adequate or inadequate in terms of scientific development, regardless of its history, would not lead us to a correct conclusion, since such classification may change when viewed from a historical perspective. When we examine scientific developments and industrial-technological advancements, we observe that there is an inductive relationship among them, and they present a pattern that follows each other.

The technological progress of Turkish society also falls in with the definitions mentioned above. When we take a quick glance at Turkish history, we could see discoveries and inventions that had changed the war doctrines, but also bitter and unpleasant experiences when moved away from the guiding light of science. This article chronologically analyses the technological developments in Türkiye before, as a quick summary, and after the proclamation of the Republic, in the context of international relations. Unquestionably, only nations that are enlightened by scientific knowledge will be able to compete with other nations in every period of time. The political conflicts in the 1980s, terrorist activities that have been prevalent near our south-eastern border for almost forty years, and the disturbances both within the country and in the regions surrounding Türkiye for the last five years have revealed the undeniably strong effect of being able to produce technology on national power. The development policy of the last two decades greatly helped the country achieve a record high rate of national technology production in various domains, but chiefly in the defence industry, since the foundation of the republican Türkiye. In this context, the National Technology Initiative stands out as a pivotal factor that will reduce Türkiye's dependency on imported technology and industrial equipment, encourage young people to produce technology by evincing the feasibility of theoretical knowledge taught in school, and increase Turkish competitiveness with other nations in this everchanging world.

It can be observed that the investments made after the end of the U.S. embargo on Türkiye, especially following the 1974 Cyprus Peace Operation, ensured that Turkish defence industry, the key component of Turkish Technology Initiative, has made a phenomenal progress. In fact, Türkiye has turned this embargo into an opportunity by heavily investing in defence industry, which has always played a leading role in technological development. After the 2000s, licensed joint production systems and/or only part-based productions were gradually replaced by original weapon systems and platforms as a result of these investments. This evolution in the defence industry has thoroughly contributed to Türkiye's relations with friendly and allied countries.

It is of utmost importance to increase social awareness of technology production and use so as to create a talent pool of qualified human capital, which is the essential resources in Türkiye's transition from mere use of technology to its design and production. The production of technology should be constant, not just a temporary progress occurred at a certain point in a country's history. Only this continuity can enable to produce national technology with high added value. For this reason, instilling and maintaining a strong sense of awareness in society, especially in young age groups, vis-a-vis national technology creation is of critical importance. In this context, TÜBİTAK and TEKNOFEST's inspiring efforts, the use of STEM learning model in primary and secondary level education seriously

helps establishing a infrastructure for raising and nourishing awareness and commitment to national technology initiative.

It was ensured that the sectoral roadmaps created for the national technology initiative are sensitive to ecosystem dynamics. These roadmaps cover the following fields: chemistry, pharmaceuticals and medical devices, motor vehicles, waterborne vessels, rail systems, machinery, semiconductors, electricity-electronics, software, national defence, aviation, and space, as well as 5G and beyond communications, artificial intelligence and machine learning, robotics and autonomy, internet of things, big data and data analytics, cybersecurity, blockchain, distributed ledger, additive manufacturing, high performance computing, unmanned aerial vehicles, space technology, nanotechnology, biotechnology, agricultural technology and energy technology (2023 Sanayi ve Teknoloji Stratejisi, 2022).

The roadmaps are of exceptional quality that can satisfy Türkiye's need for eliminating dependence on foreign technology therefore revitalising its economy and increase our national presence and influence in terms of international relations.

Countries such as the United States, Russia, and United Kingdom with strong defence industry use their technological preponderance quite effectively in their relations with other countries therefore fulfilling or securing their national interests. Accordingly, the importance of the defence industry is increasing every day as it creates the technological infrastructure of national defence, plays a determinant role in international relations and as it also leads and contributes to civilian sectors. A strong defence industry is the key to a strong-Armed Forces. Türkiye's flourishing defence industry also helps strengthen friendly ties with its export partners while bringing about an advantageous outcome for the country in international platforms.

The production and use of national technology reduces Türkiye's foreign dependency, and also facilitates the making and execution of a relatively autonomous foreign policy. Furthermore, Türkiye's export of its homemade defence industry products to its partner and allied countries both contributes positively to the country's economy and Türkiye's foreign policy goals. It is clear that the defence industry products, especially various UCAVs, exported to Azerbaijan by Türkiye during the 2020 Nagorno-Karabakh war played an important part in Azerbaijan's military victory. Likewise, similar Turkish-made military equipment had a hand in defeating separatist elements in the defence of Tripoli, the capital of Libya's UN-recognised government, or helping Ukraine with its fight against Russia's military operations.

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