

THE ITALIAN AEROSPACE, DEFENCE AND SECURITY INDUSTRY

HOW TO CREATE INDUSTRIAL DEVELOPMENT,
NEW TECHNOLOGICAL CAPABILITIES AND
ECONOMIC GROWTH FOR THE COUNTRY

Executive Summary

TEN KEY POINTS OF THE STUDY

1. The Aerospace, Defence and Security (AD&S) sector is strategic for each country

The AD&S sector performs a fundamental role in key areas for the functioning and development of each territorial system, because it sets the conditions for its security, stability and growth. In particular, there are six reasons why the AD&S sector is strategic:

- A. It guarantees, through its products and solutions, **the defence of the country and the security of citizens, companies, critical infrastructures and the territory**, ensuring the continuity of the economic activity and the prevention and management of emergencies.
- B. Acting as an **instrument of geopolitical influence**, it promotes the image and the reputation of the country and encourages sales and international cooperation agreements with other governments.
- C. It supports **exports** to foreign markets and the country's strategies of internationalisation.
- D. It is an **“innovation driven” industry** with high-intensity of knowledge, capital and technology which stimulates important investments in Research and Development and skilled employment.
- E. It is a **significant industrial sector**, supporting growth with an integrated supply chain of specialised SMEs and large global and high-tech players that are highly interrelated and with effects on different sectors of the economy.
- F. It develops **technologies and products with dual applications**, enabling transfer mechanisms and widespread benefits in other sectors.

2. The AD&S sector generates important economic/social and scientific/technological value

At the global level, the AD&S industry generates revenues of **925.7 billion euros**, with the United States and Europe together contributing almost 70% of the total. In Europe alone, the AD&S sector employs approximately 862,000 persons, an average annual increase of 2.7% between 2008 and 2017, alongside a 5.5% growth of revenues in the same period.

The sector substantially contributes to scientific progress, classified among the top 10 industrial sectors for investments in Research and Development worldwide: numerous innovations and technological solutions initially introduced in Defence have found widespread application in various fields of everyday life, facilitating and improving various activities that presently characterise our way of life. Moreover, Aerospace is the **leading sector by ratio of R&D to value added (18.2%)** in the OECD countries, ahead of Electronics and Optics and Pharmaceuticals.

3. Three global megatrends will support the development of the AD&S sector in the coming years:

- **Security and geopolitics:** growing geopolitical instability in various areas of the world (Middle East, North Africa and Sub-Saharan Africa) with a number of international immigrants that has reached a historic record of 258 million persons in 2017 (+50% compared to 2000).
- **Globalisation of the economy:** all areas of the world are going through a sustained growth phase, and the level of globalisation is increasing in terms of flows of persons and goods.
- **New technologies:** the AD&S industry is influenced by the introduction of new technologies and, more than others, lends itself to adopt cutting-edge innovations to be applied to other sectors.

These dynamics are inducing the majority of countries to increase budgets allocated for Defence (in particular in Asia, Africa and the Middle East). Also Europe has provided for an increase in investments for enhancing the AD&S sector, allocating, for the 2021-2027 period, additional resources to those of the Member States, for example, with a doubling of the Fund for Internal Security (2.5 billion euros) and allocations for the European Fund for Defence (13 billion euros) and the new European Space Programme (16 billion euros).

4. Italy holds a position of prestige in the global AD&S sector, thanks to the industrial and technological capacity of a national supply chain which expresses an important strategic value

The Italian AD&S sector is **among the top 10 in the world** and has permitted the country to achieve leadership in several important areas at the international level (1st country in the world to have a tilt-rotor aircraft for civil use under certification and among the first countries to perform joint operational activities between aerial vehicles and unmanned aerial vehicles; 3rd country in the world to launch a satellite into orbit; over 50% of the pressurised volume of the international module of the International Space Station was produced in Italy).

In 2016, the turnover of the AD&S sector in Italy was **over 13.5 billion euros**, with 69.4% destined for export, and with a contribution to the national value added of approximately 4.4 billion euros. The Italian AD&S industry employs 45,000 persons and, taking into consideration also indirect and allied-industry employment, involves over 159,000 persons.

Maintaining a developed supply chain, with a prominent leading company in the global AD&S sector, represents a fundamental strategic value because:

- It contributes to representing the country at the international level and facilitates **geopolitical alliances** in sensitive and critical areas of the world.
- It increases the development of **strategic technological expertise** in the territory by activation of a highly qualified international network.
- It is a fundamental asset for **guaranteeing the security of the territory**, managing emergencies and monitoring critical infrastructures.

5. Leonardo is among the leading manufacturing companies in Italy and in the global AD&S sector and generates value for the country, enabling an important supply chain of companies throughout the national territory

Leonardo is the leading company of the AD&S sector in Italy, **10th at the global level and 5th in Europe**. Furthermore, it is one of the main industrial operators in the country: with revenues of 11.5 billion euros in 2017, the group is positioned **2nd among the manufacturing companies and 5th among the industrial and service companies of Italy**.

The international dimension is fundamental for the development of the Group, which contributes in a significant manner to the trade surplus of the country thanks to exports of high technological content. With 78% of the value of production in Italy exported, Leonardo generates **18% of the manufactured high-tech exports of the country** and contributes 1.3% to national exports.

The Group contributes to the industrial fabric of the country, creating a supply chain made up of 4,000 companies, of which about **70% are SMEs** with sales of 3.7 billion euros in 2017.

Leonardo is also one of the **top spenders in R&D**: in 2017, it invested over 1.5 billion euros (of which 1.2 in Italy), positioning it in 4th place in the international AD&S sector and in **1st place among Italian manufacturing companies**.

6. Leonardo contributes, thanks to its own technological solutions, to the improvement of the security of people and to the activation of high-skilled employment with high levels of technological expertise

The technological offering of Leonardo makes it possible to enhance the security of people and guarantee the defence of the territory and its key players, to prevent and manage emergencies and to guarantee the security of critical infrastructures.

As of 2017, Leonardo has 45,134 employees, of which 28,892 are in Italy (equal to 64% of the total), which positions it as the **2nd manufacturing company by contribution to employment on a national basis**. Of them, 71% have a degree in a STEM disciplines (Science, Technology, Engineering and Mathematics), a value almost 3.5 times greater than the Italian average (20.2%).

At a national level, the activities of Leonardo are distributed over 48 industrial sites mainly concentrated in seven Italian Regions (Lombardia, Lazio, Campania, Piemonte, Puglia, Liguria e Toscana), with **almost 54% of Leonardo employees located in the south-central Italy**. The ratio of Leonardo employees to the total of employees in high technology manufacturing is particularly high in Italy (especially in the South, where the percentage reaches almost 29%).

7. Leonardo contributes to the enhancement of the Italian innovation ecosystem through investments in R&D and the utilisation of talent resources with a high level of scientific preparation

In 2018, Leonardo employed **9,000 people in R&D activity**, equal to about 20% of all employees. Of these, **6,200 are based in Italy** and represent nearly 7% of the R&D employees in the Italian manufacturing sector and about **10%** of employees employed in the medium-high technology industries operating within the national territory. Furthermore, in 2017 the Group invested **1.5 billion euros in R&D activities** (13.4% of Group revenues), of which 1.2 in Italy (**15.2%** of the revenues of Leonardo S.p.A.).

Leonardo has developed a solid network with research institutions, universities and SMEs and is increasingly oriented toward an “ecosystem of innovation” based on the implementation of technological Research and Development initiatives focused on **Open Innovation**: the company has started over 200 projects and established research partnerships with 93 universities and research centres all over the world, of which 48 are in Italy (approximately **40% of Italian universities**).

8. Leonardo is committed to limiting the direct impacts of its own economic activity on the environmental ecosystem in which it operates and is developing technological solutions capable of generating environmental benefits

In line with its own company values and with the objectives defined by recent environmental policies, Leonardo has improved its own direct environmental performance with **54 million in environment-related investments** in 2017 and about 100 million euros in environment-related projects in the 2015-2017 period in Italy. In particular:

- **Reduction of energy consumption** (-0.2% compared to 2016) **and of electricity** (-1.1%, in contrast with the average of the national manufacturing sector) and increase in energy used originating from renewable sources (at Group level, from 0% to 35.4% of total energy consumption between 2010 and 2017).
- **Reduction of CO₂ emissions** by 45% at Group level in the last 8 years (2010-2017), compared to -21% recorded by Italian manufacturing as a whole. Only in the two-year period 2016-2017 has this made it possible to avoid economic damages (social costs) valued between 1 million euros to 5.8 million euros caused by the negative externalities of CO₂. **Reduction of waste products** (-11.5% compared to 2016) **and an increase in recycled waste** (+16.5%), equal to 50.4% of the total.
- **Reduction of water consumption** (-12.6% from 2015 to 2017) **and improvement in the water efficiency** (-1.5% of water withdrawal volumes over production value from 2015 to 2017) at Group level.

Leonardo has also developed solutions that lead to environmental benefits, including: a) efficient technologies that reduce the environmental impact in the use phase by the customer (for example, carbon fibre aerospace); b) initiatives to reduce the use of products with a high environmental impact through a transition from product to service (for example, virtual training programmes); c) technologies that enable the management of climate change (for example, terrestrial and meteorological monitoring); d) innovations that extend the life cycle of products (for example, upgrading of on-board systems).

9. The main countries active in the AD&S sector have defined strategies and policies for sustaining and creating a solid base for the development of the sector in the coming years

The AD&S industry expresses a value that goes beyond that which is purely economic for the industrial system of a country, but it also assumes a strong geopolitical and strategic value, enabling the development of solid long-term relationships with other countries. For this reason, the main developed and developing countries have adopted specific policies to guarantee their own defence capacity in the future, to develop national industry and maintain (or create from scratch) distinctive expertise in several fields of the AD&S sector, defining in some cases a **specific medium- to long-term vision**.

The analysis of 15 countries worldwide shows several unchanging elements based on the national strategies for supporting the AD&S industry:

1. **Government-to-Government agreements (G2G)**, which are instruments for supporting exports of equipment for Defence and for the creation of long-term strategic relationships between countries.
2. **Research and development programmes** as instruments to incentivise training in new areas of strategic technological expertise.
3. **Long-term strategic vision on the part of national Governments**, taking into account the needs of industry in the process of defining the future development of the AD&S sector.
4. **International collaborations** as preferred channel for the development of products and solutions with high technological and innovative content.

10. There are 9 courses of action and proposals for strengthening the AD&S sector in Italy and preparing it for future global challenges

1. Promote a proactive role for Italy in integration and collaboration between the European systems of AD&S.
2. Adopt a long-term, strategic, multi-annual vision for public investments in Defence and Security.
3. Support the internationalisation of the AD&S sector.
4. Identify and manage the priority areas of technological expertise for Defence and Security at the strategic level.
5. Adopt a “service-supply” approach in the AD&S sector.
6. Integrate and aggregate the areas of expertise, create a critical mass of the Italian AD&S supply chain and guarantee its coordination.
7. Adopt Open Innovation and Venture Capital as tools for stimulating technological innovation and supporting investment.
8. Attract talents and create new skills for the AD&S sector.
9. Increase the awareness of the country on cybersecurity themes.

EXECUTIVE SUMMARY

1. WHY THE AEROSPACE, DEFENCE AND SECURITY SECTOR IS STRATEGIC

The Aerospace, Defence and Security sector (AD&S) performs a fundamental role in key areas for the functioning and development of each territorial system, at all levels, making it possible to generate know-how and cutting-edge technological innovation, in terms of military and civilian (dual use), and acting as a driving force for development – from top to bottom – along the extended industry supply chain.

Specifically, **the AD&S is strategic for six main reasons:**

A. Defence of the country and security of citizens, companies, critical infrastructures and the territory.

The AD&S is central for preventing and countering **internal threats** (for example, public safety and order, terrorist attacks, organised crime, attacks on critical infrastructure¹ and management of natural disasters) and participating to **international operations** (for example, support for interventions of humanitarian assistance and/or protection of individuals) and puts the basic conditions in place for the stability of the country and for its future economic development, ensuring the continuity of economic activity and the prevention and management of emergencies.

The current global scenario is influenced by many phenomena, such as demographic increase in the developing countries, migratory flows originating from the areas of the Mediterranean and the Middle East and the emergence of new threats of the “non-conventional” matrix. In this context, Italy is exposed to a growing interaction and interdependence with the rest of the world and, in particular with the Euro-Mediterranean area, rendered ever more complex today in light of the economic, social, cultural and religious balances.

These new threats – amplified by globalisation and opportunities that are enabled by the new technologies – require a progressive evolution of the instruments necessary to confront the problems of internal security and external defence, with specific attention to **cybersecurity**².

¹ For example, electrical grid, railroad network, government databases, payment systems, etc.

² In 2017, at least 1,127 serious cyber-attacks occurred (+87% in actions of espionage and sabotage and +63% in cybercrime compared to 2014). The growth of cybercrime has brought about an increase in investments in information security (96.3 billion dollars in 2018), and it is estimated that by 2021 global spending for products and services tied to cybersecurity will exceed 1 trillion dollars. Source: Clusit and UNCTAD, 2018.

B. Instrument of geopolitical influence and promotion of the images of the countries in the world.

Italy (8th economy in the world and 5th financing country of NATO) has the potential to exercise a **role of increasing responsibility at the international level** and to contribute to the economic growth, peace and development of numerous areas of the world, as well as supporting the strategic priorities of the partner countries.

As of today, Italy is participating in 32 international missions in 22 countries, with more than 6,000 units deployed (59% allocated to Asia and the Middle East): the participation in international missions acts as an instrument of geopolitical influence that contributes to **the enhancement of national “soft power”**. In this sense, the AD&S sector can act as enabling platform and a strategic “showcase” of the country on the world abroad and in numerous tables of international comparison.

A further instrument of influence in geopolitical (and industrial) relations in the AD&S sector is represented by **Government-to-Government (G2G) agreements**, through which the Administration (the Government or one of its representatives) is the sole party responsible for entering into a contract as a negotiating party and directly manages the activities of sales of defence and security systems with the applicant foreign State. In the last few years, a substantial increase in G2G agreements took place at the international level – and in the case of the United States, the United Kingdom and France – in response to the evolution of the market for military equipment and to the growing requests of purchasing Countries. In addition, such agreements enable the creation of a **“privileged” partnership** with those countries that are provided with equipment and systems for their own security.

Also, the activities of **space research and exploration** have been, and continue to be, an instrument of geopolitical influence thanks to the development and application of satellite technologies to the security and defence of the territories³. In recent times the “soft power” of Italy – which over time has been substantiated with a more sustained international presence and with strengthening of the Italian space industry – has weakened, also due to the effect of the reduction in Defence spending and in the investments in Innovation and Research that sustain some industries, including the aerospace sector.

C. Support for exports and for the country's internationalisation strategies.

Defence exports at the global level reached **the second highest value of the last decade** (89 billion dollars) in 2016.

Italy is **fifth in the world** by total value of Defence exports in the period 2007-2016 (23 billion dollars), behind the U.S., United Kingdom, Russia and France. The **authorised Defence exports** (licences) have recorded a sustained growth in

³ The “New Space Economy” is creating a value chain based on the capability of acquiring and transmitting data through technologies of high specialisation, and the control of the entire supply chain makes it possible to control data policy.

Italy: a total of 2,421 licenses, for a total value of 9.5 billion euros in 2017⁴. Also, some segments of the AD&S sector – like aerospace – have recorded a better performance compared to national manufacturing exports in the last decade.

D. Triggering of important investments in R&D and skilled employment.

From the analysis of the 2,500 top spender companies in R&D at the global level, the AD&S sector emerges as **among the top 10 sectors by company investments in research**, with a total value of **21.7 billion euros** in 2016.

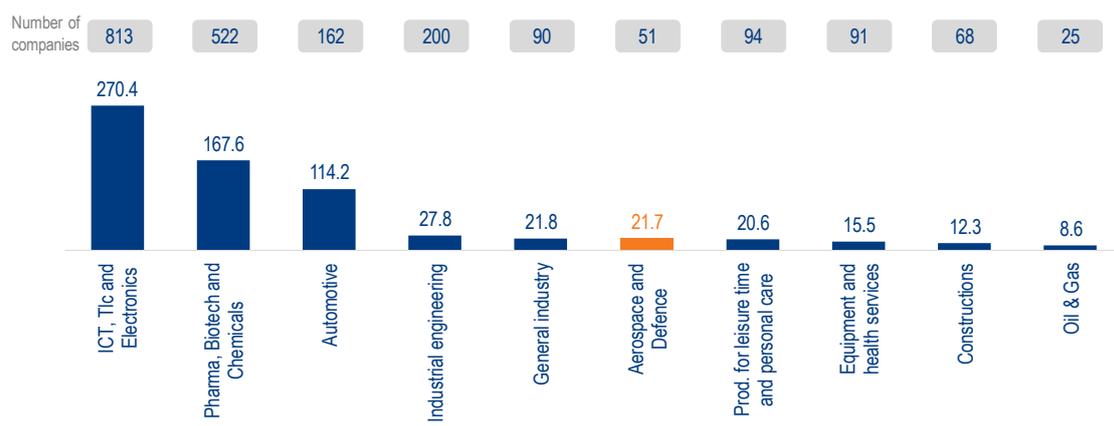


Figure I. Top 10 sectors for investments in Research and Development in the world (reference to the 2,500 global top spending companies in R&D; billions of dollars and number of companies of the sample), 2016. *Source: The European House – Ambrosetti elaboration on European Commission data, “EU Industrial R&D Investment Scoreboard 2017”*

Between 2000 and 2012, the AD&S sector showed at the global level 973,000 patent applications (16% of the total), with a growing trend, especially in the areas of research applied to aeroplane and helicopter patent families (average annual composite rate of growth equal to +7.8%), equipment for aircrafts (+7.7%) and electronic processing of digital data (+4.7%)⁵.

Among the OECD countries, Aerospace is **the leading sector by ratio of R&D to the total value added of the economy** (18.2%). Italy is fifth in the OECD area by R&D spending in relation to the total value added (21.9%) and at the global level is classified in sixth place by the number of publications and in fifth place by the number of citations in the research areas of Space and Planetary Sciences in the 1996-2017 period.

⁴ The supply of 28 Eurofighter Typhoon aircrafts for a value of 7.3 billion euros have an impact on the value of the export licences of 2016. Source: Senate of the Italian Republic, 2018.

⁵ The European House - Ambrosetti elaboration on OECD data. The total number of patent applications submitted to the EPO and USPTO and under the Patent Cooperation Treaty - PCT in the period 2000-2012 was considered for each category.

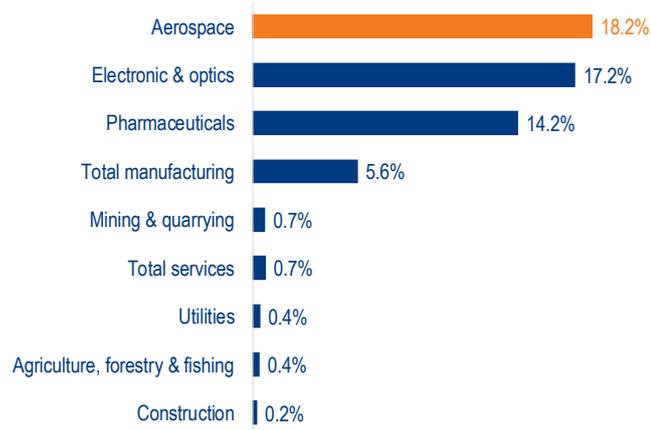


Figure II. Ratio of R&D spending to value added by sector in the OECD countries (percentage values), 2015 or latest year available. *Source: The European House – Ambrosetti elaboration on OECD data, 2018*

The role of Research and Development in the AD&S sector is assuming growing importance at the international level, especially in Europe, where the Commission has proposed for the new EU budget for 2021-2027 the allocation of 13 and 16 billion euros for the **European Defence Fund (EDF)** and for the **European Space Programme**, which operate in synergy with other European initiatives to the benefit of research in the sector.

E. Support for growth, with a supply chain of specialised SMEs and large global and high-tech players.

In the world, the AD&S sector triggers a relevant economic value equal to 925.7 billion euros. The United States of America is the top country by revenues in the sector (406.9 billion euros in 2016, 43.7% of the global market). Europe follows with 220 billion euros in 2016.

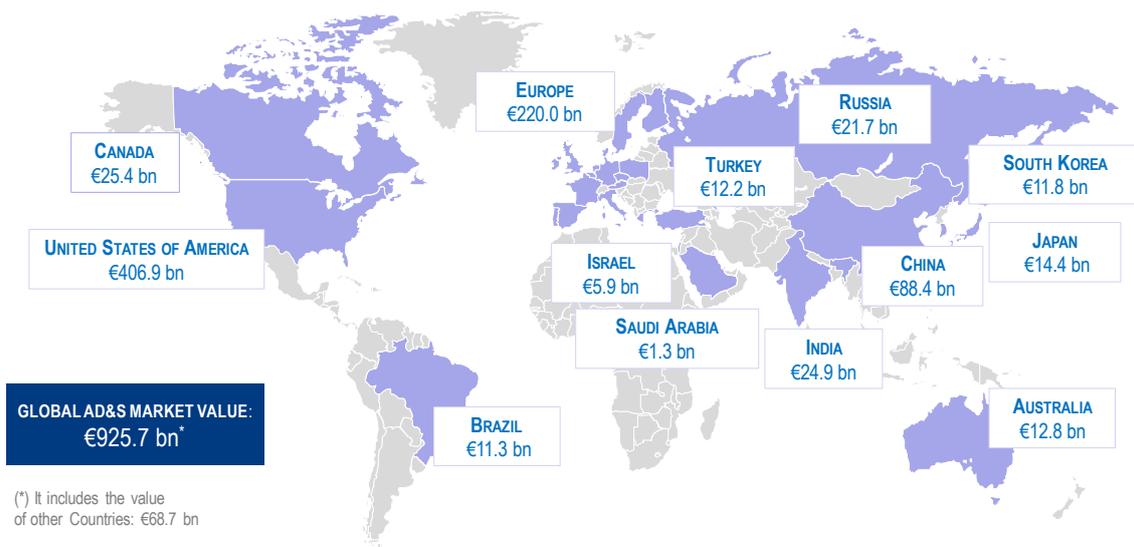


Figure III. Revenues of the AD&S industry at the global level (billions of euros), 2016. *Source: The European House – Ambrosetti elaboration on the data of MarketLine and national industry's associations, 2018*

However, this involves a very “concentrated” sector due to the effect of the presence of **large global groups**, which represent **over 43% of total revenues**. Italy is a part of the restricted “club” of countries having at least one company among the top 20 in the world with Leonardo, which is positioned tenth at the global level, with revenues of 11.5 billion euros in 2017.

AD&S is furthermore the **sixth manufacturing sector by revenues** (719.6 billion euros) in the OECD area.

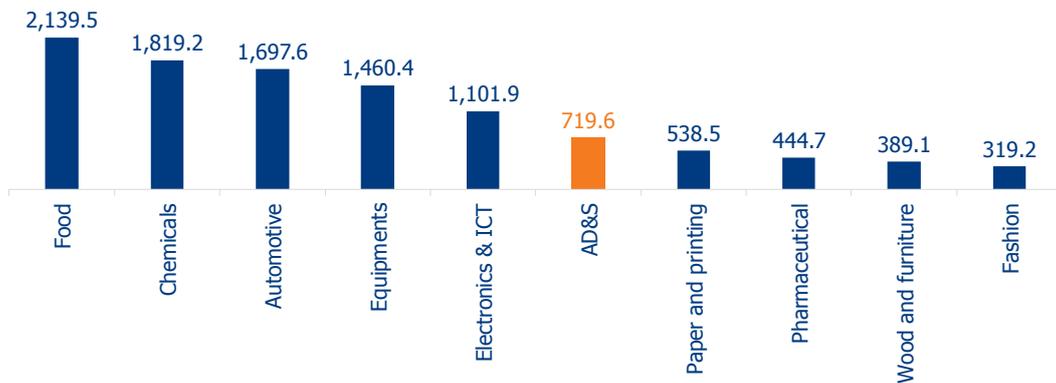


Figure IV. Top 10 manufacturing sectors by revenues in the OECD countries (billions of euros), 2016 or latest available. Source: The European House – Ambrosetti elaboration on OECD data, 2018

In Europe, the AD&S sector is confirmed to be growing (CAGR 2008-2017^e at +5.5% in terms of revenues and +2.7% in terms of employees) and has proven itself to be **“resilient” with respect to the economic crisis**, with a trend (increase of 61% in 2016 compared to 2008) greater than that of the European manufacturing sector (+24%).

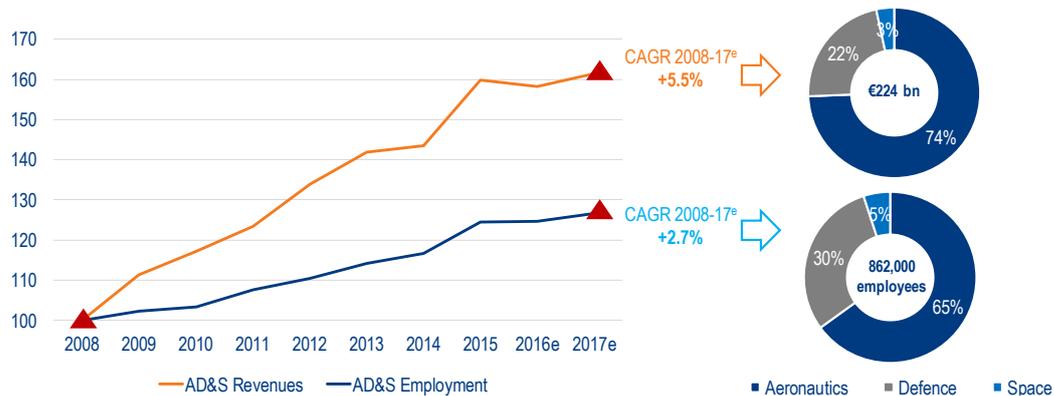


Figure V. Trend of revenues and employment of the AD&S industry in Europe (index number, year 2008=100) and allocation by segment (absolute and percentage values as of 2017^e). Source: The European House - Ambrosetti elaboration on ADS data, 2018

F. Development of technologies and products with dual applications that transfer benefits in other sectors.

Goods and technologies are considered with “**dual use**” applications when those are not exclusively for military use but are also applied in several economic sectors. For example, innovations which are very widespread today - such as the Internet, satellite navigators and sensors - were created in the military sphere and subsequently transferred to the civil sphere.

Today the line of distinction between civilian and military is increasingly thinner, with a reversal of the trend compared to the past: **Defence, in fact, depends increasingly on technologies developed within the civilian realm**, in particular those connected with electronics, communications and information technology, which have faster rhythms of innovation and development compared to the military sphere.

Large national projects in the AD&S sector have generated significant benefits for the countries that have created them. Two examples are provided by the **Apollo Project** (launched by the U.S. to demonstrate its own technological superiority compared to the former Soviet Union within the fields of space exploration and missile-defence) and, more recently, the European precision positioning and navigation system based on the **Galileo constellation of satellites**.

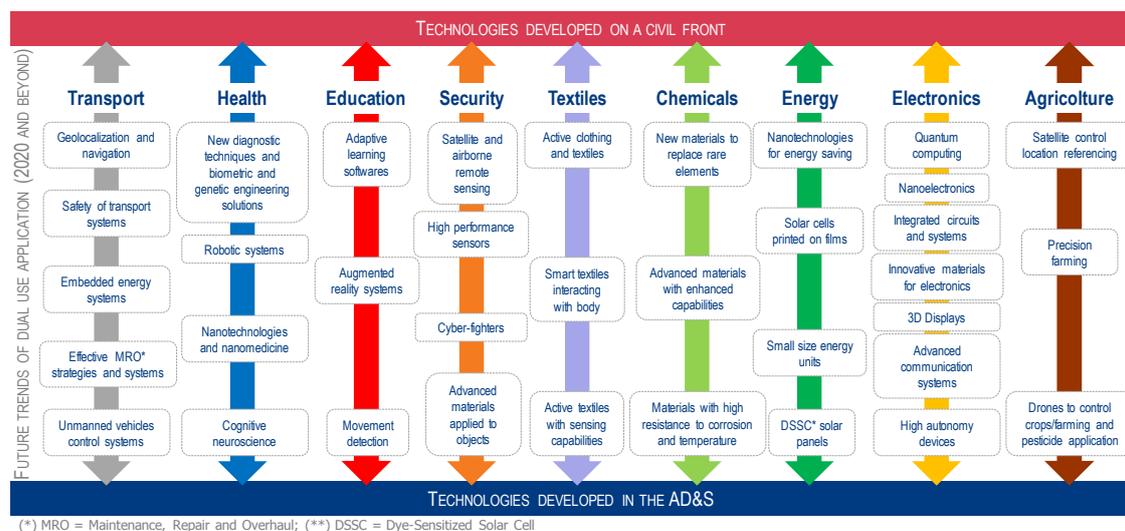


Figure VI. Dual use of application of the technologies of the future. Source: The European House – Ambrosetti elaboration on data of the European Commission and of other sources, 2018

2. FACTORS THAT SUPPORT THE GROWTH OF THE AD&S INDUSTRY AT THE GLOBAL LEVEL

The future development of the AD&S sector is pushed by structural elements of the current international scenario that can be grouped in three macro fields: security and geopolitics, globalisation of the economy and new technologies.

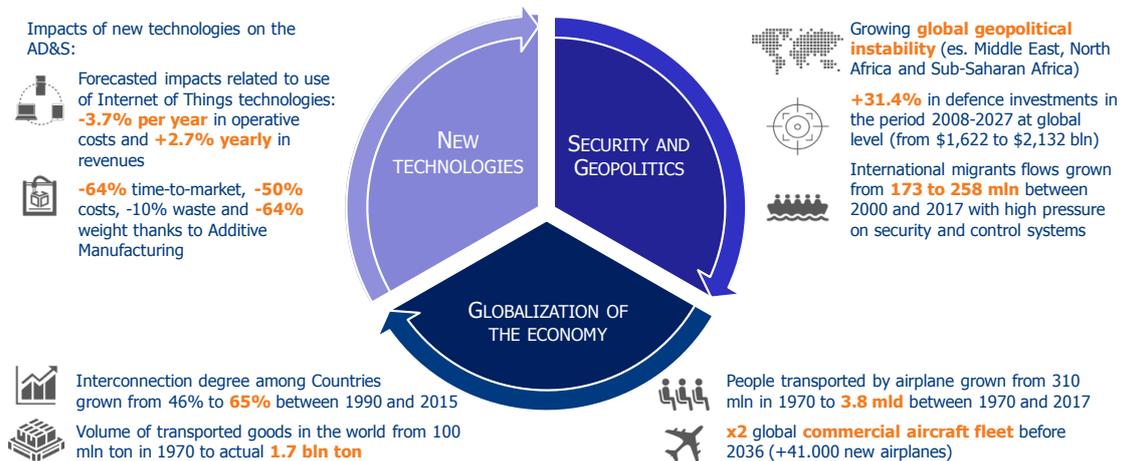


Figure VII. The structural elements of the current international scenario that influence the future development of the AD&S sector. Source: The European House – Ambrosetti elaboration on various sources, 2018

The increasing geopolitical instability, the deterioration of the “level of peace” in various areas of the world and the increase of the migratory phenomenon⁶ have caused the Western countries (and in particular Europe) to increase the level of attention regarding security, addressing resources and deploying common and integrated instruments at the EU level in the AD&S sector.

This has caused a trend of **increase in military expenditures** in order to confront the possible challenges that will appear in the future: global spending allocated to the budgets for Defence —essentially stable at around 1,600 billion dollars in the post-2008-crisis years— are forecasted to sharply increase in the future and will be over 2,100 billion dollars in 2027 (+31.4%)⁷.

⁶ In 2017 the number of international migrants reached the historic record of 258 million, with Europe in second place among the destination macro areas of the migratory flows (77.9 million immigrants in 2017).

⁷ Source: Jane’s - IHS Markit database, 2018.

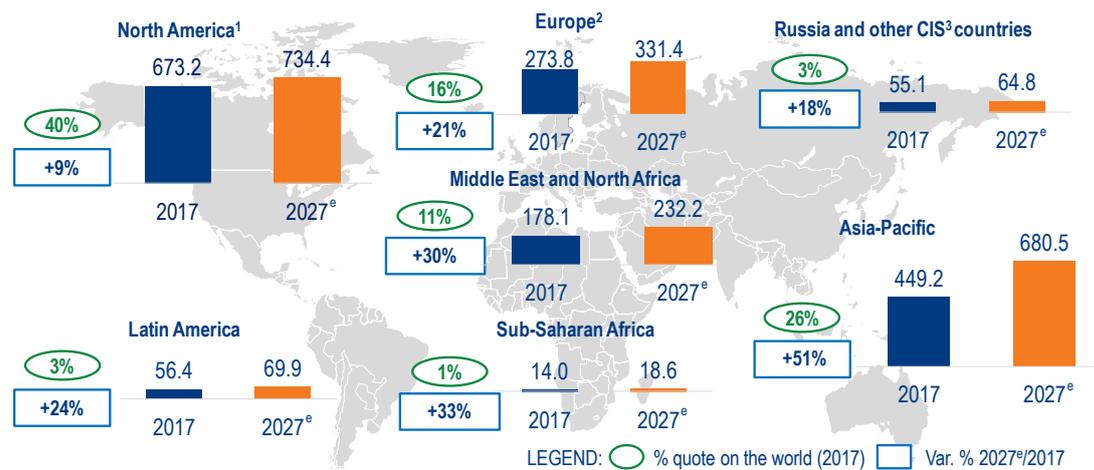


Figure VIII. Defence budgets by geographical macro area (percentage of the global total and forecasts to 2027). Notes: (*) Includes Security within the military sphere; (1) The U.S. and Canada; (2) Includes Switzerland and Ukraine; (3) Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan and Turkmenistan. Source: *The European House - Ambrosetti elaboration on Jane's – IHS Markit database, 2018*

The development of the global AD&S is also influenced by the growing **globalisation in commerce and in the relocation of persons**: for example, the value of exports between 2000 and 2017 went from 6.5 to over 17 trillion 2017 dollars (+175%), just as between 1970 and 2017, the volume of goods transported by air increased from less than 15 to 213 billion tkm⁸ and people transported by air increased from 310 million to 3.8 billion. It is estimated that between 2017 and 2036 global air traffic will grow by 1.6% per year, requiring a doubling of the commercial air fleet (putting approximately 41,000 new vehicles into the market). Also in the space sector, the industry of the production, launch and management of satellites and related services will enable an enhanced development of the so-called “Space Economy” (satellite services, space launches, ground equipment, future commercial space flights, etc.), with a global value of 348 billion dollars in 2017⁹.

Finally, the particularities of the sector (high costs of development, long production times, high rate of innovation, etc.) make it so that the AD&S industry will employ pre-eminently, more than other sectors, the new technologies available on the market. In particular, we have identified eight technologies (some of which already in use in the sector) that will permit an evolution of the AD&S sector in its manufacturing component (evolution of the productive processes) and of downstream use (new ways of benefiting from the product in order to render a service of higher quality at a contained cost): Internet of Things, advanced robotics, augmented reality, Artificial Intelligence, cybersecurity, additive manufacturing, cloud computing and Big Data analytics.

The progressive introduction of these technologies and their integration enable ongoing change in the AD&S sector, also favouring the transition from the logic of supplying one product to that of supplying a package of services that respond to the evolution of the needs of the market in a more precise manner.

⁸ Tonne-kilometre (tkm), equal to the tonnes of carried goods for the travelled kilometres.

⁹ Source: Satellite Industry Association, 2018.

3. THE STRATEGIES OF THE LEADING COUNTRIES IN THE AD&S SECTOR

With a view toward identifying the general characteristics of several key markets in the AD&S sector and the differentiating elements that they have crafted over the years, **15 countries designated as benchmarks** were more closely analysed and were selected from the main economies in the world (current and prospective) that identified the AD&S sector as a fundamental area for their economic development, delineating medium- to long-term strategic visions and launching national policies to support research, manufacture and development and enhancement of distinctive areas of expertise in the industry.

From the analysis, particularities emerge regarding the total resources allocated – for example, in terms of the budget dedicated to Defence (among the top spenders are Saudi Arabia with 7.5% of the Gross National Product, Israel with 4.6%, the U.S. with 3.3% and Russia with 3.2%) and from the trend in the last five years (increases in double figures, especially in emerging markets such as China, India and Saudi Arabia) – and approach of the adopted vision (for example, from the creation of an autonomous defence industry in Turkey and Saudi Arabia to the maintenance of one's own global leadership in the case of the U.S. and China).

It is nevertheless possible to identify several **unchanging elements** that characterise most of the countries examined and through which national strategies for supporting the AD&S industry are being developed:

1. **Government-to-Government (G2G) agreements**, which are instruments for supporting exports of equipment for Defence and for the creation of long-term strategic relationships between the purchasing countries and the supplier countries (with benefits that are also relevant for sectors other than AD&S).
2. **Research and Development programmes** as instruments to incentivise the creation of strategic expertise in new technological areas, also through close cooperation between industry, academia and research institutions.
3. **Long-term strategic vision by national Governments**, considering the necessities of industry in the process of defining the future development of the AD&S sector.
4. **International collaborations** as a preferred channel for the development of products and solutions with high technological and innovative content.

In this scenario, Italy exhibits a supply chain of Italian Aerospace, Defence and Security having a long and important tradition¹⁰ and articulated over the various domains (air, ground, sea and cyber).

¹⁰ The Italian industry traces its own origins in the previous years back to the start of the First World War, when Italy in 1917 was fourth in the world by number of vehicles produced (behind Germany, France and the United Kingdom), a position that it maintained until the early 1940s of the last century.

With revenues of **over 13.5 billion euros** in 2016 (69.4% designated for export), the Italian AD&S industry directly employs **45,000 people**¹¹.

The Italian AD&S supply chain is **active in all main phases of the AD&S sector**, from top to bottom, and shows a high degree of industrial concentration, with two companies of large dimensions and an international profile (Leonardo and Fincantieri) that occupy a prominent position in the market alongside a tight network of specialised SMEs and subsidiaries of important international players. For example, Italy is the 1st country in the world to have a tilt-rotor aircraft for civil use under certification and among the first countries to perform joint operational activities between aerial vehicles and unmanned aerial vehicles.

Also, in **space research and exploration**, Italy has achieved important industrial and scientific results: it was the third country in the world to have sent a satellite into space (after the U.S. and Russia), it had a prominent role in the construction of the International Space Station (50% of the pressurised volume of the international segment was produced by the Italian industry) and it contributed to a significant degree to the development and production of the Ariane and Vega launch vehicles. In this sector, Italy has an important leadership role (third contributor to the budget of the European Space Agency, after France and Germany) and the capacity to cover the entire value chain of the space industry: with approximately 250 companies that generate revenues of approximately 1.6 billion euros and employ about 6,000 people.

With regard to the industrial policy, the “Defence White Book” (2015) and the Law no. 7/2018 for the review of the governance of the aerospace sector in Italy represent two recent examples of policy measures launched in order to address the actions of the AD&S sector. Nevertheless, compared to the main international competitors, **it currently lacks a systemic vision for the Italian AD&S industry and an organic strategy for its implementation.**

4. THE “4 CAPITALS” MODEL OF THE EUROPEAN HOUSE - AMBROSETTI

The impact generated by the activity of Leonardo on the country was measured by applying the **multidimensional “4 Capitals” model**, prepared and developed by The European House - Ambrosetti, which permits an accurate analysis of the measurement and evaluation of the value and strategic contribution generated on the Italian territory according to a portfolio of qualitative and quantitative variables organised into **four reference areas (“Capitals”): economic, social, cognitive and environmental.**

These four macro areas interact with a fifth realm of particular importance in consideration of the business in which Leonardo operates and the presence of the Group in foreign markets. This concerns the “strategic value” of the company, intended as a cross-cutting and distinctive dimension of the AD&S sector that is tied to the **geopolitical positioning of the country** within the international context.

¹¹ Up to 159,000 people when indirect and induced employment are also taken into consideration. Source: AIAD - Prometeia, “The Defence Industrial System for the country. Recent Developments 2012-2016”, 2017.

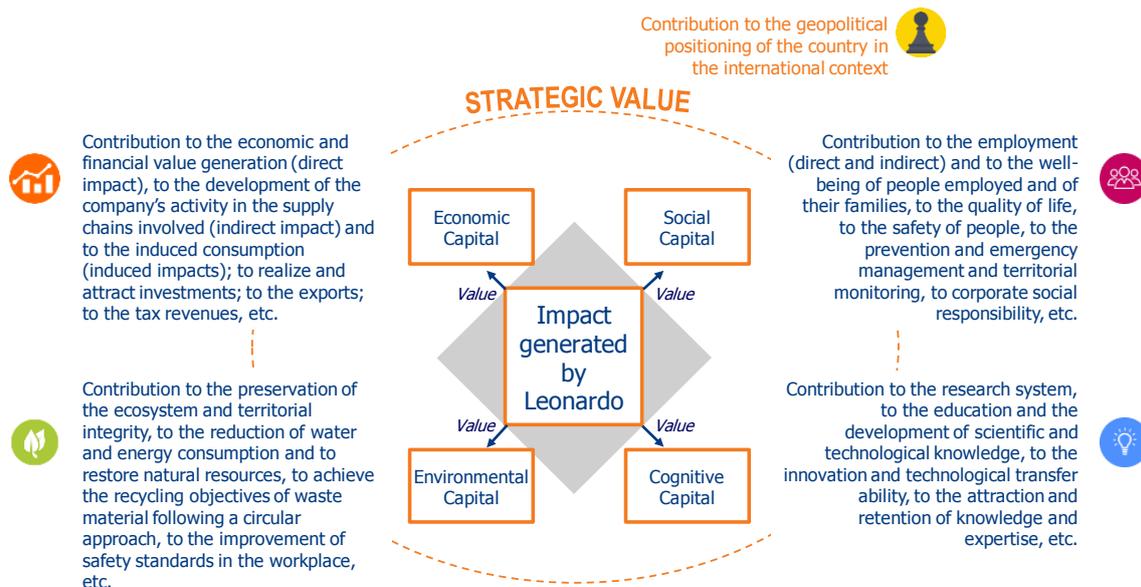


Figure IX. The methodological approach of the 4 Capitals model of The European House – Ambrosetti and its application to Leonardo. Source: *The European House - Ambrosetti elaboration, 2018*

5. LEONARDO TODAY AND ITS EVOLUTIONARY COURSE

The company Società Finanziaria Meccanica (Finmeccanica) – today Leonardo – was established in **1948** following the transfer from IRI of the ownership of the majority shares of the company operating in the national mechanical and shipbuilding sector, acquired in the first fifteen years of the entity's life. During the years following the Second World War, the company represented the **benchmark** for the mechanical industry within the framework of the IRI group and the **backbone of the national industrial base**.

In the course of the 1960s, the necessity of achieving more competitive dimensions and the will to establish a more rational structure of the state participations led the Group toward a **focus on sectors with high technological content**: railroad, thermal-electrical-mechanical and aerospace.

The economic downturn and the politics of the years during the global energy crisis, which invaded the markets in which Finmeccanica operates during the 1970s, led the company to an in-depth review of the industrial policy followed up to that point, pushing it toward an initial attempt at internationalisation, thereby anticipating the subsequent **development of foreign markets**.

The early 1990s were characterised by an economic downturn at the global level, characterised by the end of the Cold War, by the reduction of Defence budgets, by an air transport crisis and by a drop in military commitments in the space realm, which pushed Finmeccanica toward a process of production rationalisation aimed at maintaining **technological control of strategic sectors** through a series of **acquisitions and crucial alliances**, which represented the beginning of a process that would have redesigned entire industrial sectors of the country in the course of a decade.

In the mid-1990s, Finmeccanica acquired from EFIM in liquidation the Defence related companies, concentrating in the Group **over 70% of the national industrial capacities for aerospace and defence**. A process of rationalisation of the Group was started, aimed at adjusting its strategies to remain competitive at the global level.

Starting in 2002 a policy of growing expansion was implemented, with agreements and acquisitions that allowed Finmeccanica to enhance its presence in the sectors that have become its core business: **Aerospace, Defence and Security**. Starting in mid-2014, Finmeccanica started a process of profound transformation of the Group, which culminated in 2016 in the **official transformation into One Company: Finmeccanica becomes Leonardo**. The holding absorbed the controlled companies and became one operating company organised into seven divisions, each one corresponding to a specific business segment.

In 2018 Leonardo celebrates its first 70 years of activity, in which the group has played a leading role in Italian industrial history, with industrial roots that date well back before its official date of birth. Strong in its own past, but with a view oriented toward the future, at the start of 2018 Leonardo presented the new 2018-2022 Industrial Plan, with the objective of bringing to completion the evolution process undertaken toward a **sustainable long-term growth**.

The company exhibits a solid grounding at the international level, in terms of both commercial network and existing export opportunities for its own core business:

- Leonardo is present in **over 22 countries of the world**, with **170 production sites and representative offices** and new openings planned up to 2022 in **20 new countries**.
- In addition to the headquarters and the various sites of the Group in Italy, Leonardo is present in a stable way with its own production assets in three main markets –**the United Kingdom, the United States and Poland**– and has launched relevant collaborations in the main markets of the world with high potential, where it is a key partner for structured industrial collaborations.
- At the commercial level, approximately **150 countries in the world** use products, systems and services supplied by Leonardo everyday.

The activities of Leonardo, beyond the very extensive presence of the Group in the world, contribute to the **geopolitical positioning of the country** abroad and to the **enhancement of the image of Italy** – and with it, “Made in Italy” productions having high technological content.

The commitment to sustainability has also been confirmed as witnessed by the admission of Leonardo to the **Dow Jones Sustainability Indices (DJSI)** since 2010. In 2017 Leonardo was among the 8 Italian companies and among the 8 companies in the AD&S sector at international level included in the Dow Jones Sustainability Indices.

6. THE CONTRIBUTION OF LEONARDO TO THE ECONOMIC CAPITAL

Leonardo provides an important contribution to the “economic capital” of the country thanks to a **best-in-class positioning**, as one of the main industrial players in the Italian context and among the main companies of the AD&S sector at the global level.

In 2017, Leonardo achieved global revenues of **11.5 billion euros** (14.5 billion euros if we include also the Group’s aggregate pro-forma revenues), positioning itself in **second place among the Italian manufacturing companies** and in **fifth place overall among the main industrial and service companies of the country**.

The Group has maintained a key role within the Italian industrial landscape for at least 30 years, always landing among the top 4 manufacturing groups. Ultimately, Leonardo is the tenth company by revenues in the global AD&S sector and the **fifth in Europe**.

		Revenues 2017
1	FCA ITALY	28.6
2	LEONARDO	11.5
3	GRUPPO LUXOTTICA	9.2
4	PRYSMIAN	7.9
5	PARMALAT	6.7
6	GE ITALIA	6.4
7	PIRELLI	5.3
8	FINCANTIERI	5.0
9	MARCEGAGLIA	4.8
10	CREMONINI	4.0
11	MENARINI	3.6
12	BARILLA	3.5
13	GRUPPO RIVA	3.2
14	PRADA	3.1
15	GRUPPO VERONESI	3.0
16	FERRERO ITALIA	2.7
17	GIORGIO ARMANI	2.5
18	MAPEI	2.5
19	BREMBO	2.5
20	CALZEDONIA	2.3

Figure X. Classification of the 20 main Italian manufacturing companies by revenues (billions of euros), 2017. Note: The data for GE Italy, Ferrero Italy and Giorgio Armani refer to 2016 revenues by Mediobanca classification. Source: *The European House – Ambrosetti elaboration on the data of Mediobanca MBRES, corporate annual reports and AIDA database, 2018*

Internationalisation is a fundamental strategic driver for the Group, which contributes in a relevant manner to the Italian trade surplus thanks to exports with high technological content. 78% of the production completed in Italy was in fact exported on global markets: this value represents **18% of total manufacturing high-tech exports of the country** and approximately 1.3% of the total Italian exports.

As a leader in the Italian AD&S sector, Leonardo mobilises a **supply chain of 3.7 billion euros** composed of 4,000 companies, of which about **70% are SME's**¹², generating economic value in the territories in which it is operating and training numerous operators toward a greater development on the international markets, in accordance with the 8th United Nations Sustainable Development Goal (SDG 8 - Decent Work and Economic Growth). From the perspective of improving its own competitiveness within a supply chain which is gradually becoming more concentrated, the Group is carrying out a process of **strategic mapping and requalification of its own suppliers** ("Leap2020" programme) for the creation of homogeneous clusters that are oriented toward exploiting areas of technological excellence and toward growing together toward a supply chain of quality. Leonardo therefore intends to assume the role of leading company for the creation and development of strategic innovation and relevance of the country.

The activities of Leonardo generate a **direct, indirect and induced contribution** that is very important for the economy of the territories in which it operates. Applying the multiplier of the Italian AD&S sector, in fact, the value added of the company (3.3 billion euros) can generate **8.5 billion euros in the territory**. Therefore, 100 euros of value added produced by Leonardo trigger 160 additional euros in the Italian economy.

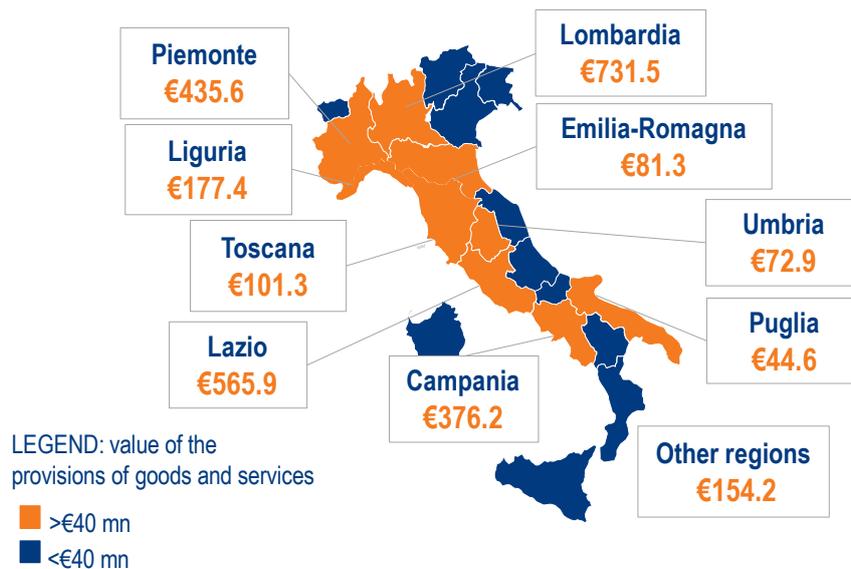


Figure XI. Value of the provisions of goods and services of Leonardo in Italy by geographic location (millions of euros and focus on the Regions with an economic value of total provisions greater than 40 million euros; the values exclude the intra-group provisions), 2017. *Source: The European House – Ambrosetti elaboration on Leonardo data, 2018*

¹² Small and medium-sized enterprises (SME's) are defined as companies having an annual turnover of up to 50 million euros and less than 250 persons employed.

Beyond that, the Group is increasing its own investments, first and foremost those in capital expenditure (CAPEX). In the next three years (2018-2020), Leonardo has budgeted total CAPEX of approximately 1 billion euros, increasing by 45.5% the amount allocated in the previous three years.

Leonardo is positioning itself in fact as **the first manufacturing company of the country for investments in Research and Development**, with approximately 1.2 billion euros spent in 2017 just in Italy (+20.7% compared to 2016), equal to **16.8%** of national expenditure in R&D for the high and medium-high technology sectors and **10.9%** of the total private expenditure in R&D of the Italian manufacturing companies.

The investments of the Group in R&D (over 1.5 billion euros, +12.1% compared to 2016) positioning Leonardo as the **4th operator in the international AD&S sector** both in 2017 and for the average of the last three years. This value is **13.4%** of total revenues (**intensity of R&D**), increasing compared to 11.4% for the previous year.

7. THE CONTRIBUTION OF LEONARDO TO THE SOCIAL CAPITAL

The activities of Leonardo generate impacts on the country in terms of “social capital” following two main trajectories:

- On the one hand, Leonardo is positioned within the national territory as one of the main industrial operators capable of **creating highly skilled employment** and with high technological expertise.
- On the other hand, in an international scenario in rapid evolution, Leonardo provides **solutions with high technological content**, the result of its development processes, which can operate in an integrated and synergistic manner to respond to emerging needs at the national and global levels.

In employment terms, as of 2017, the Group has **45,134 employees**, of which **28,892 are in Italy** (equal to 64% of the total), which make Leonardo **the second ranked manufacturing company** by contribution to employment on a national basis, in accordance with the 8th United Nations Sustainable Development Goal (SDG 8 - Decent Work and Economic Growth).

In Italy, the activities of Leonardo are deployed in **48 industrial sites**, mainly concentrated in seven Italian Regions (Lombardia, Lazio, Campania, Piemonte, Puglia, Liguria and Toscana), with almost 54% of Leonardo employees located in the South-Central Italy.

The ratio of Leonardo employees to the total of employees in **high technology manufacturing** in Italy turns out to be particularly high, especially in the **Southern Regions**, where the percentage rate reaches almost **29%**. At the regional level, the contribution provided by the company is relevant in Liguria (64.2% of all employees in high technology manufacturing), Lazio (23.6%), Campania (56.9%) and Puglia (84.7%).

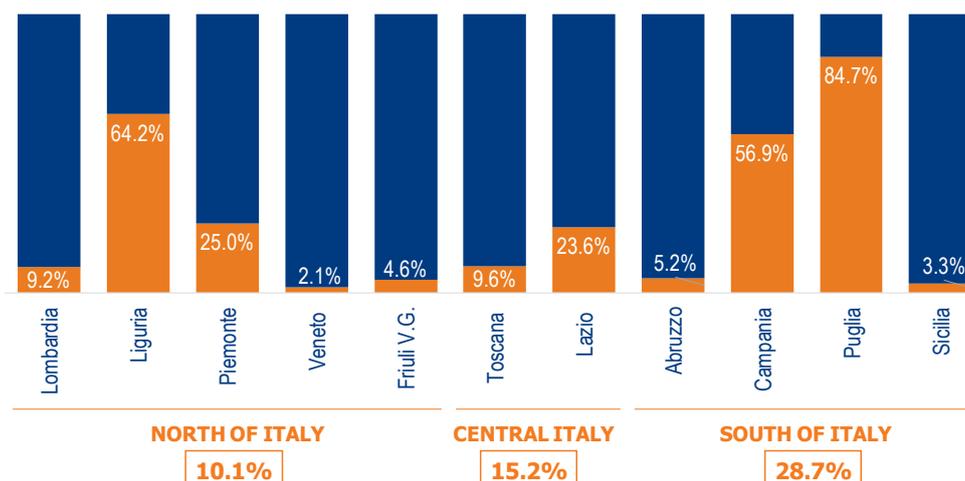


Figure XII. Employment of Leonardo relative to all employees of high technology manufacturing by Region and geographic macro area (percentages), 2017. Source: *The European House – Ambrosetti elaboration on Leonardo and Eurostat data, 2018*

Taking into consideration the employment multiplier of the AD&S sector, it is estimated that, in addition to the almost 29,000 direct employees in Italy, another 47,774 indirect employees and 27,006 employees are mobilised (induced impacts), with a total contribution of the activity of Leonardo to the country of over 100,000 people. This means that for every 100 employees of Leonardo, **260 additional employees in the national economy** are created.

If the analysis is extended to the social repercussions in the context “external” to the company, a central aspect is represented by the fact that the products with high technological content developed by Leonardo can operate in a synergistic and integrated manner to **respond to emergencies and critical situations and improve the security of people**. In a context of social fragility caused by cyclical elements of a socio-economic nature, amplified by external threats perceived as increasingly pervasive even at the domestic level (climate change or migratory phenomena come to mind here), the technological offering of Leonardo contributes to an increase of the territorial security (for example, prevention and management of emergencies territorial control, management of the security of critical infrastructures, etc.) and of its key actors, public and private (citizens, companies, Public Administration, etc.).

Cybersecurity is an important area of development for Leonardo that contributes to and advances the areas of expertise of Italy in an increasingly crucial sector at the global level. In this realm, Leonardo is involved with leading roles in numerous initiatives at the national and international level¹³.

¹³ In Italy, the following initiatives can be cited: the “*Cyber Trainer*” project, financed by the Abruzzo Region, participation in the “Start 4.0” Competence Centres for the Security and Optimisation of Strategic Infrastructures” in Liguria, and “Cyber 4.0” dedicated to *cybersecurity*, which is aspiring to and becoming a reference point in Italy dedicated to these issues within the “La Sapienza” University of Rome. At the international level, for instance, Leonardo has planned, developed and managed the NATO NCIRC - FOC programme (*Computer Incident Response Capability - Full Operational Capability*), which guarantees the security of information and ICT infrastructure in the main NATO sites at all operational levels, from

8. THE CONTRIBUTION OF LEONARDO TO THE COGNITIVE CAPITAL

Leonardo is a company with **high technological content**, deeply rooted in the industrial fabric of Italy which has known how to leverage a wealth of human resources and intensely innovative technologies, enhanced through the balance between research that is open, self-financed and financed by third parties.

In 2018, Leonardo employs **9,000 people in R&D activity** (Engineering and CTO), equal to about 20% of all employees. Of these, **6,200 are based in Italy** and represent nearly **7%** of the R&D employees of the Italian manufacturing sector and about **10%** of employees in the medium-high technology sectors operating within the national territory.

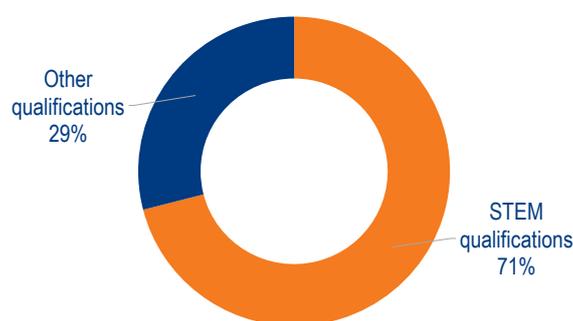


Figure XIII. Academic degrees of Leonardo employees in Italy (percentages), 2017. Note: STEM disciplines are Science, Technology, Engineering and Mathematics. Source: *The European House – Ambrosetti elaboration on Leonardo data, 2018*

The high degree of innovation and technological production is made possible by the utilisation of talented resources having a high level of scientific preparation: **71%** of Leonardo employees in Italy hold qualifications in **STEM disciplines** (Science, Technology, Engineering and Mathematics), a value almost 3,5 times greater than the Italian average (20.2%). The percentage of employees that graduated or have diplomas in technical/scientific disciplines reaches even more significant levels among new hires, with 83% of the total (data for 2017).

The high rate of technological innovation and the high level of R&D expenditures converge in the **patent portfolio** held by Leonardo. The intangible assets of the Group total 6.5 billion euros, equal to 56% of fixed assets. The evolution of the patent portfolio has had a compound annual growth rate (CAGR) of **4.13% in the last 10 years**, going from a few hundred active patent families in the first years of the 2,000's to over 1,000 current families, subdivided into many technological platforms.

In 2017 Leonardo spent 1.5 billion euros in R&D activities (**13.4%** of revenues for the Group), of which 1.2 billion euros are in Italy (15.3% of the revenues of Leonardo S.p.A.). The investments of Leonardo in technological innovations are allocated as 60% for upgrades of existing products, 35% for the development of new products and for the

individual portable devices to complex networks, ensuring information protection for 70,000 users of NATO in 29 countries.

remaining 5% the development of technologies not tied to specific applications (called Research & Technologies).

Alongside this basket of investments in Research & Development, Leonardo has developed a **solid network with research institutions, universities and SMEs** also at the European level thanks to participations in European programmes dedicated to research and innovation. In the 2007-2013 period, approximately 200 million euros have converged on the national territory thanks to research partnerships interwoven by Leonardo within the scope of the 7th Framework Programmes of the EU, equal to 5.5% of the total of European funds received by Italy in the same period.

The Group collaborates on a permanent basis with **93 universities and research centres all over the world**, including **48 universities in Italy** (around 40% of the total) and, in 2017, started 200 projects (of which 130 in Italy). In this way, it contributes to growth in the research fabric and to keeping alive excellence and relationships built at local level, **to the benefit of the whole innovation ecosystem**, including SMEs, universities, institutions and research centres. The company is increasingly oriented toward the generation of an “**ecosystem of innovation**” based on the implementation of technological R&D initiatives focused on **Open Innovation**, through the creation of **synergies between universities, research organisations and institutes and SMEs** as a strategy for forming the critical mass necessary for competing in international markets, contributing to the progress in the 9th United Nations Sustainable Development Goal (SDG 9 - Enterprise, Innovation and Infrastructure).

In addition to the consolidated relationships with universities and research institutions, Leonardo is committed to **promoting the culture of innovation** in all the communities in which it operates, in line with the 4th United Nations Sustainable Development Goal (SDG 4 - Quality Education for Everyone).

Also, in terms of **Corporate Venture Capital (CVC)**, Leonardo is among the **first-movers in Italy** and contributes to the strengthening of the AD&S supply chain: in line with the development guidelines expressed in its new Industrial Plan, in 2018 the preliminary project was defined for the constitution of a CVC fund that can contribute toward the implementation of the technological roadmap of Leonardo. This will permit Leonardo to affirm itself as the **largest Italian manufacturing company by value of the revenues to have launched a CVC fund**.

9. THE CONTRIBUTION OF LEONARDO TO THE ENVIRONMENTAL CAPITAL

Leonardo is committed to **reducing the impacts on the environmental ecosystem generated by its own company activity**, with particular reference to four macro areas (energy consumption, emission of CO₂, production of waste and utilisation of water) and contributes to the achievement of objectives set by the recent policies and environmental strategies at the national, European and international levels. The results obtained are the result of **expenses and investments focused on the environment**, in the amount of approximately 100 million euros in the 2015-2017 period in Italy. At Group level, in the year 2017 alone, these expenses and investments amounted to approximately **54 million euros** (+42% compared to 2016).

The Group utilises energy resources in an increasingly responsible way in the performance of normal company activity. The **energy consumption levels have decreased** in the last year both at the global level (-1.7%), and in Italy (-0.2%), especially with reference to electrical power (-1.1%), a fact running counter to the trend of the national manufacturing sector (+2.3%). The growing attention to the themes of sustainability is also illustrated by the **increase in energy utilised that originates from renewable sources**, both in absolute terms and as a ratio with respect to total energy consumption (at a Group level, 35.4% in 2017 compared to 32.2% in 2016)¹⁴.

In line with the objectives of the new National Energy Strategy (SEN), Leonardo is starting to progressively **decarbonise its activities**. The Group has reduced CO₂ by 45% in the last 8 years (2010-2017). This performance has made it possible to avoid economic damage from negative externalities caused by emissions of CO₂ (the so-called “social cost” of CO₂) from 1 to 5.8 million euros.

Also looking at waste production, Leonardo has improved its own performances in national activities and those of the Group. In Italy, the company has **reduced the production of waste** from 2016 to 2017 by **11.5%** and was nevertheless capable of **increasing the tons of recycled waste by 16.5% and its ratio to the total** (from 38.4% in 2016 to 50.4% in 2017).

Finally, Leonardo has **reduced water consumption** by 12.5% in the last 3 years, just like their ratio to revenues (-1.5%). This commitment has permitted a reduction in water volume required for satisfying the daily demand of approximately 9 million people.

The sustainability commitment of the Group also emerges in the development of growing **solutions of product/service and strategies of business** at the forefront that provide value for the company in environmental terms, in accordance with the 13rd United Nations Sustainable Development Goals (SDG 13 – Climate Action) and with the principles of the Circular Economy.

These solutions, with high technological content, provide a return in the form of four different types of environmental benefits:

- a. Efficient technologies that reduce the environmental impact in the use phase by the customer, such as:
 - Carbon fibre aerostructures whose use allows the reduction of fuel consumption and CO₂ emissions;
 - Systems to improve the sorting of postal and airport baggage.
- b. Initiatives to reduce the use of products with a high environmental impact through a transition from product to service, such as:
 - Virtual training programmes that reduce costs and limit the environmental and acoustic impact associated with the actual flying hours of pilots and operators;
 - Sale of “flying hour packages”.

¹⁴ With reference to Italian activities, Leonardo is capable of purchasing 100% of its own electrical energy from renewable sources and keeps a share of energy consumed originating from renewables greater than the national average (in 2017, 37.6% compared to 32.4%).

- c. Technologies that enable the management of climate change, such as:
- Terrestrial and meteorological monitoring technologies;
 - Technologies and software for more efficient management of air and naval traffic;
 - Weather satellites, drones and radar to prevent and mitigate extreme natural events, fight illegal practices (e.g. illegal waste disposal, uncontrolled extraction of natural resources from the sea bed, etc.) and manage water resources in a sustainable way.
- d. Innovations that extend the life cycle of products and systems, delaying their obsolescence and reducing the environmental impact of the disposal of materials, while maintaining high quality performance (e.g. upgrading of on-board systems, updating of mechanical scanning radars with electronic scanning radars).

The Group has also received numerous international awards thanks to the commitment and resources dedicated to environmental sustainability (including its admission to the equity sustainability Dow Jones Sustainability Indices, ECPI ESG Equity Index); in 2017, Leonardo took part to the Task force on Climate-related Financial Disclosure (TCFD), established by the Financial Stability Board, taking the voluntary commitment to communicate information on risks and opportunities linked to climate change.

10. GUIDELINES AND PROPOSALS TO STRENGTHEN THE AD&S INDUSTRY IN ITALY

We recommend intervening in the several areas that represent the key elements in order to fully promote the AD&S industry, in Italy and abroad, thereby contributing to the enhancement of the sector's structure and preparing it for the challenges that await it in the coming years.

In light of the six reasons for which the AD&S sector plays a strategic role for any country, we have identified **9 priority areas of intervention** for the national AD&S industry that, also in consideration of the external international experiences of reference, can be implemented with success in Italy.

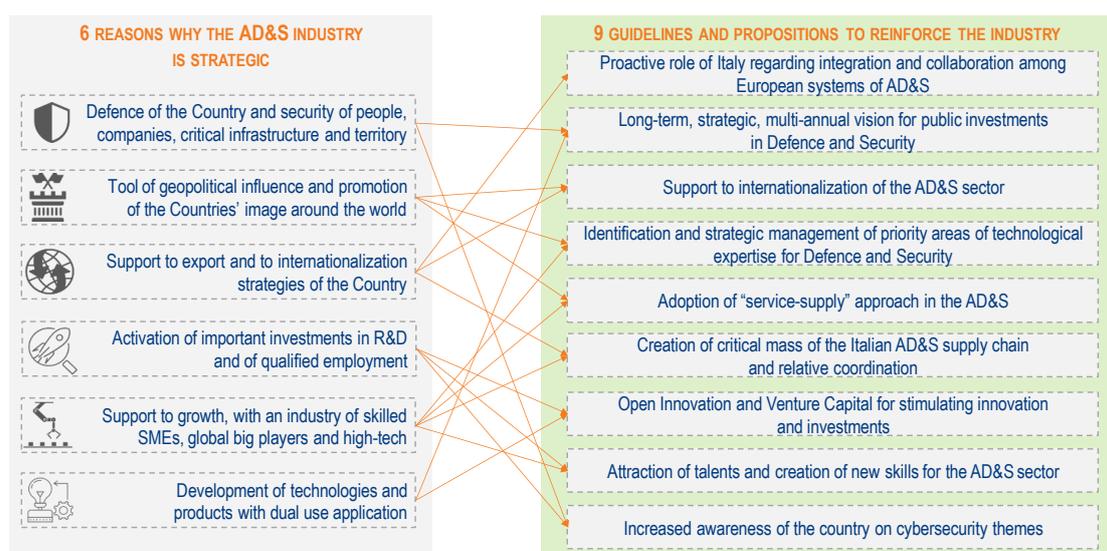


Figure XIV. Overview of the 9 guidelines and proposals for the AD&S industry in Italy and the connection with the strategic role of the sector. Source: *The European House – Ambrosetti elaboration, 2018*

In the various proposals, one thing that is constant is a **key and proactive role of the Government** in terms of leadership of action and of synthesizing and balancing the claims of the various stakeholders (starting with the AD&S supply chain and some “recipient”, intermediate and final sectors), while in others a **profound paradigm change on the part of the industry and its actors** is required for making the supply chain more solid and competitive overall.

PROPOSAL 1. PROMOTION OF A PROACTIVE ROLE FOR ITALY IN THE INTEGRATION AND COLLABORATION BETWEEN THE EUROPEAN SYSTEMS OF AD&S

The European AD&S sector is encountering a phase of **rethinking of the logics of governance** (European Global Strategy, Action Plan for European defence and new Permanent Structured Cooperation on security and defence at European level – PESCO)¹⁵ **and industrial** (in order to overcome the disparity of spending in Defence between the EU Member States and in the NATO sphere and the fragmentation of models for operation and acquisition of military equipment).

To this end, Italy must:

- a. Play a **more active role in the European AD&S market**, also in light of its positioning as 5th contributor to the NATO budget, **reinforcing the participation to common cooperation programmes** in areas of internal and external security (PESCO, European Agency for Defence, European Space Agency, etc.), with particular attention to stabilisation in the areas of the Mediterranean basin.
- b. Proactively contribute to the **identification of common requirements** for the procurement of equipment and systems for Defence and Security, overcoming the current fragmentation of standards between the 28 EU Member States to achieve a unification of the requirements at the European level.
- c. **Participating in initiatives of international co-development** in the aerospace sector, in projects with high potential on the economic/commercial front, also for maintaining the prestige of the country in the world and promoting and protecting the key-competences of the national AD&S industry.

PROPOSAL 2. ADOPTION OF A LONG-TERM STRATEGIC MULTI-ANNUAL VISION FOR PUBLIC INVESTMENTS IN DEFENCE AND SECURITY

The AD&S sector requires medium to long times for development, subsequent commercialisation of new platforms and products (over 10 years) and modernisation and renovation of the equipment. To maintain an efficient operation of the defence apparatus, multiannual planning of investments with a long-term time horizon is therefore fundamental (at least 15 years). In a context of growing rationalisation of costs

¹⁵ The exit of the United Kingdom (traditional Italian industrial partner) from the EU risks of strengthening the Franco-German axis and exposing Italy to the danger of weakening and marginalisation within the European Defence sector.

and focus on areas of priority investment among countries with a relevant AD&S industry, **Italy has experienced the greatest average annual contraction of the budget allocated to Defence in the last five years (-0.8%¹⁶).**

To this end, Italy must:

- a. Adopt a **long-term and shared (between Government, Defence, industry) vision** for the AD&S sector and a **multi-annual planning of investments** and industrial policies that clearly and precisely identify the actions to be undertaken to reach the objectives delineated in the vision (guaranteeing stability, certainty and continuity of the investment commitment over time that transcend changes of Governments).
- b. **Bring into implementation the provisions** (to date not yet implemented) of the **“Defence White Book”** of 2015, also in consideration of the strategic importance and the particularities of the AD&S sector.
- c. Provide a **scale appropriate for the financial resources allocated to Defence** in alignment with the values of comparable countries (for example, France, United Kingdom, respectively with 1.97% and 2.12% of GDP compared to 1.37% in Italy).
- d. Define a **strategic vision of the underlying industrial supply chain** through the identification of the reference perimeter of the sector (according to priority criteria and technological specialisation in strategic key areas) and the policy that can be activated with a systemic approach (for example, policies for R&D and innovation, policies for training, measures for support of SMEs, creation of the necessary infrastructures, instruments of financial support, etc.).

PROPOSAL 3. SUPPORT FOR THE INTERNATIONALISATION OF THE AD&S SECTOR

The export of equipment for Defence suffers from a volatile trend over time connected to important one-time commitments, which often require years of delicate negotiations and a constant commitment, also on the political side. Relative to the procurement of equipment for Defence, the stipulation of **Government-to-Government (G2G) contracts** is frequent. In Italy to date, the application of this instrument (already adopted in the United States, in the United Kingdom and in France) is limited because the regulations in effect restrict the involvement of the State or the Ministry of Defence **to mere technical/administrative support¹⁷ and doesn't entail their direct involvement in the commercial negotiations.**

To this end, Italy must:

- a. **Revise the regulations in effect regarding the foreign sale of defence and security systems** in order to include the possibility that the State, or a legal

¹⁶ CAGR of the *budget* allocated for Defence in the 2003-2017 period, calculated on data from Jane's - IHS Markit, 2018.

¹⁷ For example, administrative/legal management of the contract and quality control, support in the research of financing, training activity and education, technical assistance, engineering, logistics/maintenance of the purchased equipment.

representative thereof, can act as guarantor and mediator of the transactions; furthermore, the creation of a political “control room” at the highest levels (for example, the Presidency of the Council of Ministers) that is tasked with the responsibility to sign the agreement, possibly supported by a technical entity.

- b. **Identify** – also in light of the foreign benchmark experiences – **an entity** (pre-existing or to be set up, also in a public/private form) **responsible for the activities of negotiation and sales** to third party countries of military equipment products from the national industry that acts as a guarantor and intermediary on behalf of the purchasing countries.
- c. **Define the viable options for modulating the types of G2G contracts** according to the market opportunities, providing a transition for defining full compatibility with European regulations, for example, on matters of State assistance, and sanction implications and definition of responsibilities (in case of delays and application of penalties).

PROPOSAL 4. IDENTIFICATION AND STRATEGIC MANAGEMENT OF THE PRIORITY AREAS OF TECHNOLOGICAL EXPERTISE FOR DEFENCE AND SECURITY

To date the **process of identification of the priorities of focus** for Italian Defence is still ongoing, by formal identification of the key areas of strategic expertise that enable technological superiority and guarantee autonomous capability to conduct its own foreign policy.

To this end, Italy must:

- a. **Identify the sovereign and collaborative areas of expertise**¹⁸ – and the related technologies – that can allow Italy to maintain and strengthen its own positioning in many operational domains (ground, air, space, naval and cyber) according to guiding criteria of interoperability, technological intensity, dual application and sustainability (also economic/industrial) in the medium to long term.
- b. **Create a participatory process** that promotes dialogue between demand (the Presidency of the Council of Ministers, the Ministries of Defence and of Economic Development, the Armed Forces) and supply (national industrial system and the scientific world) in order to identify and evaluate strategic industrial and technological activities.
- c. **Launch European collaborations** regarding technologies in which Italy can make its own assets and areas of expertise a common factor with the allied countries, also leveraging the participation of Italy in 15 of the 17 common projects of PESCO, regarding technological areas envisioned by the new Framework

¹⁸ “Sovereign” areas of expertise are defined as the critical technological capabilities at a country's disposal or the ones that it needs to adopt and about which it needs to maintain a degree of national sovereignty for national defence needs (supply of the Armed Forces) and/or for the national interest (exercise of geopolitical and economic influence linked to the possession of such technologies); what are “collaborative” are the technological capabilities in which to invest together with other international partners and allies, and to share with them.

Programme Horizon Europe 2021-2027 and regarding other European programmes that can generate direct impacts on the investments of the AD&S sector (for example, European Space Programme, European Defence Fund, Digital Europe Programme and Connecting Europe Facility).

PROPOSAL 5. ADOPTION OF “SERVICE-SUPPLY” APPROACH IN THE AD&S SECTOR

In the procurement of equipment and systems of the AD&S industry, a transformation of paradigm in the provision of resources for optimizing costs and quality is under way with the **adoption of performance-based long-term contracts** that permit public organizations to increase efficiency and reduce costs (with greater readiness and availability of systems and greater focus on Operations) and to AD&S players stability in the flow of revenues in specific value-added services in the medium to long term. Considering the Italian Defence, the current impact of regulations still does not provide full recourse to this type of contract: there are only a few types of logistical contracts (together with the purchasing contract) that exceed 3 to 5 years.

To this end, to align with the best international practices (like United States and United Kingdom), Italy must:

- a. **Adapt the regulatory and administrative framework** to introduce the logic of “supplying military capability” in Defence procurement of the AD&S sector.
- b. Promote the evolution of the offering from a single product/service to a **“portfolio” of integrated specialist services** capable of maintaining the operationality of the equipment with efficacy and efficiency over the entire life cycle: upstream (activities for training personnel, technical/engineering support, accompaniment during the phases of simulation/testing, etc.) and downstream (maintenance, technological upgrading or repair of equipment, etc.).

PROPOSAL 6. INTEGRATION AND AGGREGATION OF EXPERTISE AND CREATION OF CRITICAL MASS FOR THE ITALIAN AD&S SUPPLY CHAIN AND RELATED COORDINATION

In a context characterised by producers/assemblers that “shorten” the supply chain and by the emergence of new global scale operators, Italy must confront an AD&S sector formed by a plurality of SMEs that generates a **fragmentation of the technological/industrial areas of expertise** into numerous production districts (also because of the historic evolution of the AD&S sector in Italy) based in specific areas of the country¹⁹.

The current situation impedes to adopt a **“systemic approach” at the national level and attainment of the critical mass** required to strengthen the capacities of its companies to grow and be competitive and create players of medium dimensions, overcoming the current segmentation between large international OEMs and SMEs that are just national.

¹⁹ For example, the French Aerospace Valley of Toulouse and Bordeaux (France), with 859 companies, employs twice as many employees as all of the Italian aerospace districts.

To this end, Italy must:

- a. Support the aerospace SMEs in collaborating more with the large companies via **aggregating processes** with *ad hoc* instruments oriented toward attaining the critical mass (also on a translational scale) that is necessary to become a primary supplier, if not true and proper risk sharing partners within the supply chain relative to international projects (managed by companies of other Member States or by European consortia).
- b. Promote interactions and exchanges of expertise among the various Italian industrial districts, taking advantage of the present points of contact between many of them (for example, ICT, mechatronics, automotive, renewable energies): it is possible to provide a specific internal function to the individual districts that acts as a point of contact and an instrument for promoting **inter-district transfer of technology and expertise**.
- c. Promote a **greater capability of coordination among the operators of the AD&S supply chain**, also enhancing the specialisation among different technological/ of product / application domains in the spirit of “being a team”, in order to attribute greater power to the country to position itself on international markets with an integrated offering of products and services in various domains.

PROPOSAL 7. OPEN INNOVATION AND VENTURE CAPITAL AS INSTRUMENTS FOR STIMULATING TECHNOLOGICAL INNOVATION AND FOR SUPPORTING INVESTMENTS

Modifying the traditional paradigms of collaboration regarding research and innovation and the related financing modalities represents an opportunity and a great challenge for the Italian AD&S sector, which is historically prone to carry out research activity internally and needing to overcome some resistance, such as a change in organisational culture and the financing of greater investments in this direction.

To this end, Italy must:

- a. Support the **dissemination of a model of Open Innovation** which facilitates dialogue, evolution and growth shared among different parties – actors within the ecosystem of innovation, industry, territories (for example, creating a platform of Open Innovation based on public/private partnerships for the AD&S sector that are capable of monitoring the demand for innovation originating with the large industrial operators and placing it in direct connection with the supply of innovative solutions originating from large-scale companies, SMEs, start-ups and spin-offs).
- b. Define a **model of governance for research and innovation that overcomes the fragmentation of the actors**, the roles and the instruments, with a single governing “pivot” responsible for an accurate “mapping” of the innovation produced at the regional level in Italy, the promotion of a course of rationalisation of districts, poles of innovation and business incubators (oriented toward a greater “critical mass” of resources and expertise) and identification of a large research project for the country regarding a technological field with high potentiality (for example, applications of quantum technologies and cybersecurity for the defence of critical infrastructures).

- c. Increase the **critical mass of public and private resources dedicated to research and innovation** in a few high potential sectors, supporting first and foremost the development of a solid Venture Capital market (with the creation of a public-private Venture Capital fund dedicated to the AD&S sector that can promote a “cultural contamination” within the companies).

PROPOSAL 8. ATTRACTION OF TALENTS AND CREATION OF NEW SKILLS FOR THE AD&S SECTOR

In Italy, graduates in **STEM disciplines** (Science, Technology, Engineering and Mathematics) are only 13.5% of the total, compared to 19.1% of the EU average. The AD&S sector can be the main point of reference for training in areas of expertise relevant for the new labour market, thanks to product innovation and highly qualified labour, which attracts: in this case the capability of AD&S enterprises to become the spearhead of a new model of training in the areas of expertise for Industry 4.0 narrowly depends on the virtuous relationship that they will be able to establish with national university institutes.

To this end, Italy must:

- a. **Enhance the offering of specialised training** for the AD&S sector, integrating it with the specific development needs of the companies of the sector through the institution of a working group—in which the Industry, the Ministry of Education, University and Research (MIUR) and the university system participate—that is oriented toward implementing a system of training integrated along three main axes (universities poles, large enterprises and SMEs) in order to make the offering greater, updated at the university and post-university level with respect to the specific needs of the sector (definition of the curricula and teaching of cross-cutting areas of expertise, such as cybersecurity and ICT).
- b. Utilise the **Competence Centres of Industry 4.0 as “open laboratories”** in which the companies of the AD&S sector can dialogue with students and researchers about the opportunities offered by the industry and by the most relevant technological and transformation trends in dual use logic.
- c. Launch a communication **strategy on the attractiveness factors** of the Italian AD&S sector for attracting the best talents (in Italy and from abroad).

PROPOSAL 9. INCREASE THE AWARENESS OF THE COUNTRY ON CYBERSECURITY THEMES

The **investments in cybersecurity** are a priority topic of the main economies in the world, employed to defend critical infrastructures and the security of companies, governments and individual citizens from new emergent threats by definition of specific strategies and collaborations for confronting and mitigating cyber-attacks.

To this end, Italy must:

- a. Promote the **dissemination of the culture of information security in order to create greater awareness** regarding the potential risks (also economic) associated with cyber-attacks in the production system and in the public sector.
- b. Utilise and encourage **international cooperation** on a dual level (cooperation between universities and research centres of international significance in the field of cybersecurity and partnerships between Italian and foreign companies for the development of new services and technologies).
- c. Perform a series of interventions oriented toward guaranteeing the **full operability of dedicated national structures** and fostering the expertise required for acting in a timely manner in the field of cybersecurity.
- d. Include the **investments in security for cyber defence** in the 2% of GDP that the allied countries of NATO (and, in particular, Italy) have committed to reserve for Defence spending in order to stimulate the creation of greater expertise.
- e. Increase investments for the **enhancement of instrumental and organisational resources** for cyber protection and information security.

