INDUSTRY 4.0

CAPITAL GOODS SECTOR
FACTS AND FIGURES
SPECIAL BUSINESS AREAS
INVESTMENT POLICY AND PROMOTION
EVENTS AND PRESS
RESOURCES AND CONTACTS
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1. EXECUTIVE SUMMARY
The Italian capital goods industry is one of the driving forces of the Italian and European economy. In 2018, its turnover reached the value record of 49.2 billion euros, which corresponded to 2.8% of the Italian GDP. This exceptional result was achieved by particularly innovative and specialized companies which provide flexible, customized and creative solutions to satisfy a diversified range of needs.

Among the different sectors represented by the capital good industry the machine tools, robotics and automation business show an outstanding manufacturing excellence. Their state-of-the-art specialization "Made in Italy" plays an important role in the country’s international trade relations. In 2018, Italy confirmed its third place worldwide among exporting countries, its fourth place among the machines tool manufacturers and its fifth place in the world consumption ranking.

Considering only the robotics sector, Italy resulted to be the sixth country in the world and ranks second in Europe for annual installations of industrial robots in 2018. Industry associations and experts confirmed that an increase of the demand is expected within the next years.

The automatic packaging machinery sector is another part of the manufacturing industries where Italy holds an international leadership position. According to the preliminary statistics elaborated by the trade association UCIMA, the sector generated a total turnover of more than 8 billion euros in 2019. The packaging machinery manufacturers, which are mainly located in the so-called "Packaging Valley" in Emilia Romagna, offer products characterized by high level of technology, quality, flexibility and customization.

The outstanding results of the capital goods industry have been achieved thanks to its ability to exploit new business opportunities given by the implementation of new digital technologies, which allowed these companies to stay competitive in the market. According to the statistics elaborated by Politecnico di Milano, capital goods is the second industry in the world after automotive that mostly invested in the new digital technologies. Industry 4.0 is advancing, but at different levels, depending on the sector and on the size of the companies.

Indeed, most of the Italian small and medium enterprises still need to start and/or speed up their digitization process. For this reason, since 2016, different national government Industry 4.0 plans (i.e. Industry 4.0, Enterprise 4.0 and Transition 4.0) have stimulated the demand for new innovative and technological solutions with a low environmental impact. Moreover, the Italian government established an Industry 4.0 national network, which aims at supporting companies in the use and integration of digital technologies to create new sources of growth and jobs. The industry 4.0 national network leverages skills, know-how and experiences provided by many excellent universities, research centers, science parks, trade associations and companies.

With a variety of best practice examples of leading companies and expert interviews, this report highlights current developments and future prospects of the capital goods and industry 4.0 market. They aim to inspire Austrian companies to realize new business opportunities in cooperation with Italian partners, thus enhancing their competitiveness not only in Italy or in Austria but also on the international market.

This report has been finalized during April/Mai 2020 and includes some important information on the impact of the COVID-19 crisis on the Italian industry.
2. CAPITAL GOODS SECTOR

The Italian capital goods sector is one of the most important driving forces of the Italian economy and a world-leading industry in terms of production levels and export strength. The Italian manufacturers belonging to this sector are worldwide well-known for their flexible, creative, customized and innovative solutions with extremely high technical standards. Moreover, they offer products with technical assistance, maintenance and global consultancy services. In this way, the industry can satisfy a great variety of specific needs and serve markets that differ in terms of geographical location, production needs and industrialization. Italian companies active in the capital goods sector are represented by the trade association Federmacchine.

2.1 Current description of the sector

According to the data elaborated by Federmacchine, in 2018, the capital goods industry turnover reached the value record of 49.2 billion euros, which corresponded to 2.8% of the Italian GDP. This extraordinary outcome was mainly due to the increase of export (+4.6%) and domestic sales (+9.6%). The expansion of the domestic demand rewarded also importers (+9.4%), which held 38% of the market share. Also the number of employees of the capital goods sector increased, thus representing 4.2% of the Italian manufacturing industry.

Table 1: Evolution of the Italian capital goods sector 2016 to 2018.

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<td>EUR Mio.</td>
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<tr>
<td>Turnover</td>
<td>42 136</td>
<td>46 322</td>
<td>49 198</td>
<td>9.9</td>
<td>6.2</td>
</tr>
<tr>
<td>Export</td>
<td>29 199</td>
<td>31 500</td>
<td>32 948</td>
<td>7.9</td>
<td>4.6</td>
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<tr>
<td>Domestic sales</td>
<td>12 937</td>
<td>14 822</td>
<td>16 250</td>
<td>14.6</td>
<td>9.6</td>
</tr>
<tr>
<td>Import</td>
<td>8 365</td>
<td>8 977</td>
<td>9 821</td>
<td>7.4</td>
<td>9.4</td>
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<tr>
<td>Consumption</td>
<td>21 293</td>
<td>23 799</td>
<td>26 071</td>
<td>11.8</td>
<td>9.5</td>
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The distinctive characteristic of the Italian capital goods sector is its success on the international markets: in 2018, the ratio export/turnover reached 67% and they achieved a share of 7% of the total Italian export of goods. Due to the fact that exports are more than three times higher than imports, the trade balance results to be extremely positive for Italy, attaining to 23.1 billion euros in 2018.

Table 2: Trade balance of the Italian capital goods sector from 2016 to 2018.

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<td>EUR bn.</td>
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<td>Trade balance</td>
<td>20 843</td>
<td>22 523</td>
<td>23 127</td>
<td>8.1</td>
<td>2.7</td>
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The machineries and mechanical devices sector is the Italian industry with the highest trade surplus. The graph below highlights its key positive contribution to the Italian total goods trade balance and its pivotal importance for the Italian economy.
2.2 Italian machine tools, robots and automation systems’ manufacturers sector

The excellent results of the capital goods industry have also been achieved thanks to the outstanding performances of the machines tools, robots and automation systems manufacturers. Since 2014, this sector has undergone a significant growth because of the strong demand coming from domestic and foreign markets. Indeed, exports were pushed by the favorable economic situation, especially in Germany, which is the main destination for those products “Made in Italy”. Moreover, domestic demand was boosted by incentive provisions for competitiveness, such as Hyper-Depreciation and Super-Depreciation, included in the Industry 4.0/Enterprise 4.0 plan.

In particular, 2018 was a record-breaking year for the Italian machine tools, robots and automation systems’ sector: Italy confirmed the third place among exporting countries, the fourth place among the machines tools manufacturers and the fifth place in the world consumption ranking.

Figure 1: Italian trade balance per sector in 2018. Data in billion euros


Figure 2: Summary of the position of Italy among the machines tools, automation and robotics manufacturers countries
As shown in the above figure, 2018 production reached the record value of 6.125 billion euros. This result was obtained thanks to the strong sales performances both on the domestic market, whose value (3.12 billion euros) has increased of 15.2%, and on the foreign markets, as exports have grown by 8.2% to 3.067 billion euros.

However, as highlighted by the preliminary year’s data processed by the Italian machine tools, robots and automation systems manufacturers’ association UCIMU-SISTEMI PER PRODURRE, 2019 marked an end of the positive trend started in 2014. Nevertheless, the registered decrease is very moderate and states how the main economic indicators are slowing down towards normal values, after the records achieved in 2018.

As confirmed in a press release on 29th January 2020 by Massimo Carboniero, President of UCIMU-SISTEMI PER PRODURRE, the progressive reduction of orders collected in Italy in 2019 is mainly due to the fact that “the Italian consumption is going back to normal values that are typical of our market. After all, we could not expect Italian demand to keep the growth rate registered in the three-year period 2016-2018”, when it was boosted by the incentives provided by the government through Industry 4.0 and Enterprise 4.0 plans.
In 2019, the Italian production went down to 6.51 billion euros, recording a 3.9% decrease compared to the previous year. This result was mainly due to the negative performances on the domestic market, as internal sales went down by 6.5% to 2.91 billion euros, and to the slight decrease of exports by 1.7% to 3.59 billion euros. The Italian consumption of machine tools, robots and automation systems fell by 6.0%, to 4.85 billion euros.

Despite the decrease of the collected orders, Austrian machine tools are still very appreciated by the Italian market. According to UCIMU foreign trade elaborations of ISTAT data, in 2019 Austria was the 11th most important machine tool supplier and the second exporter of metal forming machine tools in Italy after Germany. On the contrary, Austria was the 16th most important customer for Italian machine tools manufactures.

Considering trends and possible future developments of the sector, Massimo Carboniero stated in the same press release on 29th January 2020 that “the situation is very complicated, as there are different factors contributing to the uncertainty of the mid/short-term scenario: the general economic and political instability of many areas in the world; the evident difficulty of Germany, struggling to start up again, burdened by the big question in the automotive sector regarding the development of electric vehicles; the sanctions concerning exports to important end markets for the enterprises working in manufacturing sectors, first of all Russia and Iran; the slowdown of China and the protectionist behaviour of some important countries, such as the United States”.

The already complex situation worsened after the sharp increase in COVID-19 infections around the world and especially in Italy. In order to contain the spread of the pandemic and safeguard employee health, the Italian government was forced to temporarily close companies, including the machine tool ones. Even if estimates and forecasts are still not available as uncertainty is very high, coronavirus will certainly have a profound and wide impact on the economic, financial, technological and work organization aspects of the sector and, in general, of the industry.

An example of innovative company: Cosberg S.p.A. Cosberg S.p.A is a medium-sized Italian company leader in the mechatronics and robotics industry. With more than 22 million euros of yearly turnover and more than one hundred employees, the company designs and produces machineries and modules for the automation of assembly processes. Cosberg has always considered its most valuable resource not a tangible and physical asset, but its vast know-how, as it constitutes the basis of a company’s competitive advantage. Every year Cosberg invests more than 18% of its turnover in the design and development of new ideas for the industrial automation and, for this reason, it currently holds around 40 patents. As stated by Gianluigi Viscardi, CEO and founder of Cosberg, “in the past, the value of a company was given by its physical assets, while nowadays know-how is the real key resource. But how do you keep this knowledge inside the company, especially when employees leave?” The company developed a project called “Global Knowledge” that consists in classifying and storing any technical project through digital tools, so that it is easier for employees to find it, update it and use it to create new products. The result was a 30% increase in the efficiency.

Another key point underlined by Gianluigi Viscardi is the importance of investing in innovation to be competitive on the market, especially with Chinese competitors. Indeed, every entrepreneur should keep in mind that “every day is a Grand Prix for a company and the challenge is to win at the pit stop.” Viscardi continues explaining that “the company competitiveness can be compared to Formula 1 races, where victory and defeat are determined during pit stops: key moments are those when the real strategic and organizational skills of teams arise and the objective is to reduce at minimum maintenance time while keeping high performance levels.” In the same way, machinery manufacturers’ objective should be to reduce at minimum machine stops, so that is possible to enhance clients’ productivity and competitiveness. For this reason, Cosberg applies hundreds of sensors on their machineries, in order to better control production process and to detect errors in a predictive way. A collaboration with Miraitek, a spin off startup of Politecnico di Milano, led to the development of a monitoring system which controls the process in real time and act if necessary. It is also able to do analyses and comparisons in order to evaluate potential performance improvements. Michele Viscardi, son of the CEO and Business Development Director of Cosberg, explains that with this system “it is like having a doctor and a personal trainer at the same time: the doctor takes care of you, while the personal trainer enhances you”.

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To increase productivity and competitiveness, Cosberg promotes open innovation projects, i.e. the exchange of know-how to create shared added value in collaboration with other companies, universities, research centers. For this reason, the company founded in 2007 **Intellimech**, a private consortium of large, medium and small companies aimed at interdisciplinary research in the field of mechatronics. The headquarters is located inside **Kilometro Rosso**, one of the leading private innovation hubs in Europe.

Moreover, Cosberg has established different partnerships with Italian and multinational enterprises and it is involved in different projects promoted by **Lombardy Regional Government**, the Italian **Ministry of Economic Development** and European Union.

### 2.3 Italian robotics sector

Robotics industry is one of the few sectors in the world that is strongly increasing, mainly driven by the constantly growing demand coming from China and other Asian countries. In 2018, Italy resulted to be the sixth country in the world and holds the second rank in Europe for annual installations of industrial robots.

Figure 5: Top 15 countries for annual installation of industrial robots in 2018. Data in thousands of units

Italy was confirmed as the second European market after Germany and the seventh country in the world for industrial robot consumption in 2018. In the last years, the exponential demand of industrial robot coming from Asian countries has led Italy to fall down in the world ranking of robot consumption. Indeed, Italy was the fourth market in 2008, while today it is in seventh place.
Figure 6: Top 15 largest market for industrial robots consumption in 2018. Data in thousands of units


According to 2018 Italian robotics sector report elaborated by UCIMU-SISTEMI PER PRODURRE, the Italian robotics companies benefited from the domestic and foreign favorable conditions and all the economic indicators registered a positive growth rate. Indeed, production increased by 9.4% compared to the previous year, reaching a value of 650 million euros. This result was based on the increase of export (+9.1% with a value of 240 million euros) and domestic sales (+9.6% with a value of 410 million euros).

The Italian robotics consumption registered an increase of 13.1% to a value of 870 million euros. Also in the first six months of 2019, robots’ orders have registered a slight increase (+2.5%).

Figure 7: Industrial robots installed and sold in Italy from 2008 to 2018. Data in thousands of units


According to statistics elaborated by the International Federation of Robotics (IFR), the largest customer of industrial robots in Italy in 2018 was the metal and machinery sector, which is one of the most important Italian industries.

Food, plastic & chemical products and automotive sectors are also increasingly investing in industrial robots to automatize their production processes.
It is also the second country in the world for the use of industrial robots in the textile and wood industries.

In order to deepen how industrial robots are used by Italian manufacturers companies, a survey was conducted by Giambattista Gruosso, professor of Electronic, Information and Bioengineering Department at Politecnico di Milano. The interviewed companies are members of SPS Italia Scientific Committee and most of them belong either to packaging (38%) or machine tool (31%) industries.

According to the survey, 56% of the interviewed companies reported to use robots mainly in production lines and processes, while only 31% used them to carry out experimentations. 13% declared of not applying robots in their companies.

Considering the main application areas, robots are mostly used for product handling (38%), followed by machine tools (31%), assembly (31%), palletizing (31%) and product pickup (19%). Please note that the sum of percentages is over 100% because more applications may be used by the same company.
Data collected by IFR confirmed handling as the main application area, followed by assembly and welding.

The main challenge robot-makers have to face is to provide clients with increasingly cheaper and safer robots characterized by a higher speed, payload and reach. Indeed, the current limits of robot manufacturers are the trade-off between speed and precision and the possibility to keep high industrial robot production in high labor cost countries. Moreover, clients require a strengthening of man-machine interaction skills and an easier integration between robots and already-existing systems.

Meanwhile, robot-user companies need to acquire high programming competences (automation, motion, robotics, software development and simulation, development of operator interfaces) and digital skills (management and protection of information, digital identities, devices, artificial intelligence) in order to exploit all robot functionalities. For this reason, companies should invest in hiring highly specialized personnel and in training on employees, so that they can learn how to cooperate with robots.

**Focus: The Italian robotics cluster**

According to the association **UCIMU-SISTEMI PER PRODURRE**, Italian industrial robotics manufacturers are mainly specialized in the production of handling robots, which represented 56.2% of the total in 2018. In particular, handling for molding plastics is the industrial robotics application mostly produced by the Italian companies. Other important market segments are welding and cutting robots.

The Italian robotics sector is made up of large-sized enterprises (whose turnover is higher than 5 million euros), which represent 92.9% of the total.

Piedmont and Lombardy are the regions with the highest density of companies operating in the industrial robotics market, with 35.7% of the enterprises respectively. Piedmont robotics companies attained the highest turnover (53.8% of the total) and employed the highest number of people (70.7% of the total). This outcome is due to
the high concentration of big-sized enterprises [e.g. Comau]. Moreover, Piedmont has a historical robotics know-how, as the first Italian robotics companies were established in this region which have invented some important robotics models (i.e. the first measuring robot of DEA in 1965, the first assembling robots of Olivetti in 1975 and the first laser robot of Prima Industrie in 1979).

Focus: Robotics trends and future developments
During the “robotics and automation: challenges for integration” conference organized by SPS Italia on 14th November 2019, three robotics trends were identified by Paolo Rocco, Full Professor of robotics and automation systems at Politecnico di Milano.

Soft robots are made of soft materials instead of metal pieces to improve interactions with humans. These robots, which were first created by two Italian scientists Cecilia Laschi and Barbara Mazzolai, are now studied by researchers, universities and robot-makers all over the world. From the joint researches of the University of Pisa – Research Center "E. Piaggio" and IIT – Italian Institute of Technology, a new spin-off company called qbrobotics was founded. By implementing soft-robotics technology, this startup produces innovative devices such as robotic hands, grippers, handles, delta robots and VSA actuators. These products use the natural principles of motion control, which is the same of the muscular system of animals and men, in order to create robots that are smooth and safe in their interactions with humans.

Soft robots are also studied in the Biorobotics Institute of Scuola Superiore Sant’Anna in Pisa, which is one of the most important bio robotics research centers worldwide.

Humanoid robots are designed to resemble men. Two of the most famous humanoid robots are Walkman and iCub, both created by the Dynamic Interaction Control Research Lab of the Italian Institute of Technology (IIT).

Collaborative robots (or cobots), designed for the collaboration and cooperation between robots and men in complete safety and proximity. In particular, robot-makers are focusing their attention on the development of two main different cobots:

- robot which passively supports man work (e.g. exoskeleton)
- robot which actively supports man work (e.g. for the collaborative assembly)

The solutions developed within this field can ease the repetitive movements and relieves the effort of operators in carrying out daily activities with a passive mechanism, thus improving ergonomics and work quality.

Robots can work in proximity with operators without the need of fences or barriers because they are able to understand men movements and avoid collisions. This ensures a greater work quality, as robots perform the most dangerous and repetitive operations. With a higher efficiency, as non-value-added activities are reduced, they increase company productivity.

However, the development of these robots implies the enhancement of their cognitive level to improve man-machine interaction skills. For this reason, researchers are studying Artificial Intelligence solutions and systems.

According to the IIT robotics researcher Francesco Nori, “all the collaborative robots available on the market have the same characteristic: they stop themselves whenever they touch a person. This avoids possible collisions and incidents, but it prevents the physical collaboration with humans.” IIT researches noticed that these robots miss the ability to forecast and understand people health status. “Hence, the idea of developing wearable devices that are able to read people movements and to transmit them to machines. This device is able to understand and measure fatigue to which the musculoskeletal system is subjected in carrying out certain actions or movements”. The data collected by the wearables allow robots to prevent workers from doing excessive efforts, thus improving work ergonomics.

However, collaborative robots are studied not only by research centres and universities, but also by enterprises. According to the survey conducted by Giambattista Gruosso, 75% of the interviewed companies members of SPS
Italia Scientific Committee declared to focus their research on the development of new AI algorithms to be applied to robots.

For example, Smart Robots, the Politecnico di Milano spin-off startup co-founded by prof. Paolo Rocco, developed a 3D perception and Artificial Intelligence device that makes collaborative robots understand when they must intervene within a production sequence based on operator’s movements. Paolo Rocco stated that “with this system a 20% cycle time savings on the manual operations can be achieved”.

As stated by robot manufacturers (e.g. ABB, Comau, Fanuc, Kuka, Mitsubishi Electric Europe, Omron Electronics, Tiesse Robot – Kawasaki Robotics, Universal Robots, Yaskawa Italia) during a robotics and automation conference, future robotics researches will focus on the development of:

- active exoskeletons, to better help operators in their daily activities;
- mobile robots, that are able to act in an unstructured environment (e.g. follow men, take tools that are not in the standard position etc.);
- easy-to-use robots, to create more human-friendly robots for operators;
- robots in office, hospitals and other service companies;
- robots integrated with predictive maintenance in order to know which is their health status;
- robots able to do maintenance on machineries or to refill materials where needed.

Safety is a key topic for any robot-maker and can be guaranteed in different ways:

- the traditional solution is to install gates which ensure that operators respect the safety line and avoid any direct contact with them.
- if collaborative robots are installed, systems are created to allow close interactions between men and robots. However, this is still a niche solution;
- the use of laser scanning is a middle way because it allows operators and robots to collaborate in a safe way. This solution has a high potential for applications.

A future “robotics valley” in Genova
IIT – Italian Institute of Technology is planning to create a robotics valley in Val Polcevera in Genova. The project consists in creating new industrial robotics labs, where IIT researchers will test and develop new technological transfer solutions in collaboration with companies, including Ansaldo Energia, Danieli Automation, Camozzi Group and Leonardo.

Moreover, two competence centers (START 4.0 of Genova and ARTES 4.0 of Pisa) and Digital Innovation Hub Liguria will be involved in the project to enhance interactions between science and industry and to provide training courses to companies on the implementation of 4.0 digital technologies.

An example of industrial robotics company: COMAU
Comau (CConsorzio MAcchine Utensili – machine tool consortium) is an Italian multinational company and a subsidiary of car manufacturer FCA group (Fiat Chrysler Automobiles). Comau is a company leader in the industrial automation field with an international network of eight manufacturing plants, seven innovation centers and five digital hubs with more than 9,000 employees worldwide.

Comau has always offered products, services and technologies for the automotive sector. However, in the last years, new specific automation requests coming from the general industry allow to enlarge Comau products portfolio. Indeed, the company was able to combine its traditional knowledge in the automotive industry with its innovation ability in order to satisfy these new manufacturing needs.

To enhance the creation of innovative ideas, Comau decided to form an inter-functional team, which involves different professional roles coming from different Business Units and departments of Comau and from different countries, including Italy, India, Brazil, US and China. Indeed, according to the information/decision-making the-

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ory, groups with a broader range of task-relevant knowledge, skills, and abilities are expected to be more creative in the development of new ideas and more effective in the comprehension and analysis of complex problems.

A proof of the greater creativity of diverse groups is witnessed by Alessandro Bruno, Head of Digital Initiatives Platform of Comau, which explained that “this inter-functional team developed new IoT solutions, that allowed machines to connect with the central system, both on-cloud and on- premise way. The outcome of this team work can be summarized in a digital platform called in.Grid, which is composed by four main products: SMTS (Smart Manufacturing Tracking System), MES (Manufacturing Execution System), IoT and A&PM (Autonomous and Professional Maintenance).”

All Comau products and services are developed under a new innovative concept, called ‘Humanufacturing’, which places man at the center of the factory. According to this vision, industrial robots should no more be closed in cells, but they can collaborate with men in an efficient and safe way. Indeed, industrial machines are becoming smarter, increasingly flexible and easy to use within the integrated and connected industrial process. Moreover, Comau covers its traditional robots with a soft material, which includes proximity and contact sensors. In this way, in case of a contact or closeness to robot skin, the machine reduces its speed till stopping. “Thanks to this technology, we can cover robots and also end-effectors or grippers, thus providing users with not only a collaborative robot, but also an entire collaborative application”, as stated by Massimo Calvetto, Head of Sales of Comau.

‘Humanufacturing’ vision led to the development of MATE (Muscolar Aiding Tech Exoskeleton), an innovative exoskeleton designed to ease the workload, thus improving ergonomics and quality of work life. MATE was developed by IUVO, a spin-off company of the Biorobotics Institute of Scuola Superiore Sant’Anna in Pisa and later acquired in joint venture by Comau and Össur.

To better exploit all the functionalities of robotics automatic solutions, people should be trained to use them in an efficient and effective way. For this reason, Comau decided to open Comau Academy, where students can learn basic programming concepts.

Comau is also collaborating with other companies for the development of new innovative solutions.

For example, OpenRobotics is a solution created by Comau and B&R, the Austrian company specialized in machines and factory control systems, HMI and motion control. Both the partners contributed in the project by bringing their own knowledge and expertise: Comau supplied the robot arm and cables, while B&R provided the automation components and software for machines.

Instead, Keba, the Austrian developer and manufacturer of automation solutions, and Comau partnership led to the creation of KeMotion, which has a unique and shared hardware and software platform that allows to control and manage Comau robots with the same PLC (programmable logic controller) language.

2.4 Italian automatic packaging machinery industry

The Italian automatic packaging machinery sector is one of the manufacturing industries where Italy holds an international leadership position. With a turnover of more than 8 billion euros in 2019, it is one of the Italian sectors with the highest export share (almost 80%).

According to UCIMA (Italian Packaging Machinery Manufacturers Association), the leadership position of the Italian automatic packaging machinery industry is based on four essential factors: “a high level of technology and product quality; an extremely high level of customization and operating flexibility of machinery; rapid after-sales support in all world markets; and a high degree of competitiveness due to the combination of large integrated groups and highly specialized small and medium-sized enterprises that as a whole offer a full range of machinery for all types of products.”

The 200-250 large-sized machinery manufacturing companies are mainly based in the regions of Emilia-Romagna, Lombardy, Piedmont and Veneto, together accounting for more than 80% of the sector’s companies.
The highest concentration of sector companies is in the so-called "Packaging Valley" in the province of Bologna.

Figure 12: Packaging Valley in Emilia Romagna

The most important client market for the packaging machineries companies is the food sector, which accounts for around 60% of the sector turnover, followed by pharmaceutics, cosmetics and toiletries (just under 25%). A minor part of the turnover is coming from the tobacco sector, where the Italian machinery industry has a long tradition, and from the chemicals/petrochemicals and tissues industry.

According to the preliminary studies published by UCIMA Research Department, the packaging machineries sector has continued to grow during 2019 (+1.8% on 2018), thanks to the positive performances achieved both in Italy and in foreign markets.

Specifically, the Italian market has grown by a further 3.2% to a total of 1.713 billion euros, which was partly due to the Industry 4.0 incentives. However, the majority of the turnover (78.6%) is created by exports, which also rose by 1.4% to 6.293 billion euros.

“We are satisfied and proud of this latest achievement, which demonstrates that our industry is solid and dynamic, capable of establishing itself at a global level and fully exploiting the development of international markets and all our client sectors,” commented Enrico Aureli, chairman of UCIMA, in a press release on 20th December 2019. “But there is no room for complacency as we are facing tough challenges, increasingly fierce competition and highly unstable scenarios.”

The already cautious forecasts for 2020 were heavily influenced by the COVID-19 pandemic. The sanitary emergency forced the Italian government to establish a lockdown and to temporarily close most of the business activities. However, the sector of automatic packaging machinery for food, beverage and tobacco industries was considered necessary to guarantee the production of essential goods and services, and consequently it remained active, albeit at a slower pace.

An example of a packaging machinery company: IMA
IMA Group is a world company leader in the design and production of hi-tech automatic packaging machines for the pharmaceuticals, cosmetics, food, tea and coffee industry. The group has approximately 6,000 employees and 45 production plants located all over the world. In 2018, revenues amounted over 1.5 billion euros and the export propensity was around 88%.

In 2017, IMA started its digital transformation process through IMA Digital project, which has been developed in four main directions: smart machines, smart services, smart factory and smart organization.

According to Dario Rea, IMA Research & Innovation manager, digital technologies allowed the company to manage the increasing complexity, given by the difficulties in operating in different geographical locations and business lines. The introduction of IoT enables the collection and the analysis of machines data in order to optimize production performances and to satisfy new clients’ needs. Indeed, “the creation of smart products for our clients is the essential premise for the creation of new services and other digital transformation activities”. Smart
Machines are the outcome of a complex integration process between the acquired knowledge and machine learning techniques. These innovative products are easily adaptable to environmental conditions and are able to suggest improvements or adjustments. As stated by Rea, “the natural next step aims at the creation of the Autonomous Machines, that will guide IMA towards the use of collaborative robotics to perform repetitive power and restore operations. The objective is the reduction of unplanned non-added value activities”.

According to Pier Luigi Vanti, IMA ICT manager, the digitization and optimization of the technical assistance processes led to an increase of efficiency and effectiveness, thus delivering a higher customer service level at lower costs. Indeed, today IMA technicians do service interventions on the clients’ machines using tablets, which include all the back-office information (e.g. the history of the product, user and troubleshooting manuals). Technicians can also access to 3D files, “thanks to which they can navigate within the components and explore machines before manually proceeding”. The operator “not only uses information, but is able to benefit from it: by inserting data into the system, it helps to build the history of the machine and achieve technological and engineering improvements”.

Considering the Smart Factory direction, IMA introduced a PLM (Product Lifecycle Management) digital platform to improve information exchange and the management of product quality and lifecycle. Pier Luigi Vanti explained that “PLM is a worldwide collaborative platform available for all our stakeholders: clients, partners, technical and other business units. Anyone collaborates bringing its own knowledge”. The new digital platform allows the company to monitor all the products lifecycle and this enable a better management of the complexity given by the creation of extremely tailored-made machineries.

In the meanwhile, IMA is creating a “Smart Organization” through the development of two main HR projects: the first one is MyIMA, a worldwide intranet platform for all the employees “where anyone can share information. This allows implementing new organizational models and a tight collaboration between offices and people, from Argentina to China till US”. The second project is Human Capital Management (HCM), which aims at improving employees’ competences and skills. According to Massimo Ferioli, coordinator and IMA Digital project manager, HCM is “the PLM of HR, another global platform that manages employees’ working lifecycle, from recruitment till retirement.” The platform highlights different career aspects, wage and the capability to professionally grow in terms of training and experiences on the job.

In conclusion, Pier Luigi Vanti, IMA ICT manager, explained that “the four directions we pursued are complementary to each other. They are like the legs of a table: there must be all four ones. However, I fully realize that small-sized companies cannot tackle all these issues together. Therefore, if I had to indicate priorities, I would say that the first point to act on is the product (with the introduction of new technologies). Then I would take care of the human development. Smart manufacturing follows. Finally, smart services.”
3. INDUSTRY 4.0 IN ITALY

Industry 4.0 is a disruptive, global and unstoppable process, which will turn industrial production into an automated and interconnected one. However, this digital transformation process is long and complex and, for this reason, the adoption rate of digital technologies in Italian enterprises is still low.

As stated by Carlo Bonomi, newly elected president of the most important Italian industry association Confindustria, industry 4.0 investments are a priority in the current economic situation as "there is no future without them". As a matter of fact, Confindustria’s Strategic Plan 2030/50, which it will be presented in autumn, will invite companies to concentrate resources on the essential priorities: investments in innovation and research, human capital, environmental and social sustainability, new organizational structures and support to the export-oriented supply chains.

3.1 Main actual and future digital technologies trends in Italy

According to researchers conducted by Politecnico di Milano, the market of Industry 4.0 projects registered in 2018 an increase of +35%, thus reaching the value of 3.2 billion euros. However, in 2019, a slight decrease in the growth rate [+20-25%] is expected.

The most widespread Smart Technologies are the ones linked to Information Technology (IT) cluster: Industrial Internet of Things holds 60% of the market with a value of 1.9 billion euros, recording a sharp increase [+40%] in 2018. Industrial Analytics ranked the second place, with a +30% of growth rate and a value of 530 million euros, which accounted for 17% of the market. In the third place, Cloud Manufacturing grew up by 35% to a total of 270 million euros and 8% of market share.

Within the Operational Technologies (OT) cluster, Advanced Automation has the highest market share with 160 million euros and +10% of growth rate, followed by Additive Manufacturing with 70 million euros. The highest growth rate is registered by Advanced Human Machine Interface, which is still a niche technology with a total of 45 million euros.

Consultancy and training activities concerning industry 4.0 projects registered the smallest market value, totalizing 220 million euros [+10%].

The result of this survey states that Italian companies are investing in new digital technologies, but not enough in competences and skills of their employees.

Alessandro Perego, Andrea Sianesi and Marco Taisch, professors and Scientific Officers of the Industry 4.0 Observatory of Politecnico di Milano, explained that "lots of industrial digital technology investments and projects were launched in 2017, boosted by Industry 4.0 national plan, and then they were invoiced in 2018, thus accelerating the expansion of the market, that is more than doubled in the last four years". "Smart Technologies awareness and knowledge are now widespread in all the industrial companies of the country. However, in order to catch all the opportunities offered by this digital revolution, it is necessary to clearly define an organizational role that drives the digital transformation, as well as to support new technologies with an organizational model able to involve workers, which are the end users of these technologies, in all phases of 4.0 projects".

According to the survey conducted in 2018 by Industry 4.0 Observatory on 192 companies (153 large companies and 39 SMEs), the Italian Industry 4.0 market is very dynamic, as almost 800 applications were registered, on average four per company, distributed in three main process areas: 42% of the projects concerned Smart Factory (production, logistics, maintenance, quality, safety and compliance with standards), 33% involved Smart Lifecycle (product development, life cycle management and supplier management) and the remaining 25% belonged to Smart Supply Chain (planning of physical and financial flows).

In the next two years, almost all the companies are planning to invest in Industrial IoT (48%) and Advanced Automation (33%). However, considering a time span of three/five years, priorities change based on the enterprise size: large-sized companies follow a long-term investment strategy, focused on advanced technologies like Artificial Intelligence and Blockchain. Conversely, SMEs prefer to invest in Cloud, Automation and Additive Manufacturing, thus proving a more cautious approach.
Figure 13: Summary of the Italian companies’ investments in Smart Technologies in the next years

Elaborations from Industry 4.0 Observatory of Politecnico di Milano, industry 4.0: the revolution is made with people (June 2019).

Small and Medium Enterprises are the backbone and the key factor for the competitiveness of the Italian economic system. In 2018, Industry 4.0 Observatory studied different approaches SMEs have towards the digitization process. The analysis of the results led to the identification of different behaviors, called “personas”, which depend on the level of digital maturity and industry 4.0 technology investments in terms of assets and FTE (Full-Time Equivalent).

Figure 14: Summary of the companies’ “personas”

Elaboration from Politecnico di Milano, MADE presentation (2019).

A great share of the Italian SMEs has either an indifferent or a fearful approach, so the first countermeasure is to inform entrepreneurs about the opportunities and advantages of implementing industry 4.0 technologies. Moreover, they need guidance to define a digital transformation process strategy.

Sensible and brave SMEs have just started their digital innovation process, but they are in need of internal highly-specialized competences in order to successfully complete the Industry 4.0 transformation.

Finally, only 2% of Italian SMEs can be defined as “digital champions” because they are “digitally mature enterprises and represent a benchmark for the majority of companies, which know that they have to do something in order to increase their digital maturity level”, as prof. Sergio Terzi, director of the Industry 4.0 Observatory of Politecnico di Milano declared during an interview on 16th December 2019. “However, – went on the professor – especially small enterprises find it difficult to invest in digital technologies. This is partially due to a financial reason, as a small company has less money to invest compared to a large-sized one. Another important reason is linked to the cultural aspect.” Indeed, the typical Italian SME environment is characterized by a small group of
decision-makers, which find it difficult to understand the opportunities linked to the digital transformation and, for this reason, they are unwilling to introduce changes in their companies. This limit is mainly due to a lack of technological and managerial culture. Lastly, the political hurdle also slows down investments, as Italian (frequently changing) governments do not have a tradition to establish long-term plans.

In order to encourage SMEs to increase their digital innovation adoption, many experts are trying to limit the cultural obstacle. In particular, Prof. Terzi observed that “IT vendors and technology transfer stakeholders [e.g. industrial associations, startups incubators, investment companies and regional governments] can incentivize, share and speed innovation culture, especially the digital innovation one. When IT vendors and technology transfer stakeholders make a partnership, good initiatives for companies can be successfully carried out.”

For this reason, Politecnico di Milano is involved in many associations and institutions (e.g. MADE competence center, Cluster Smart Factory, AFIL – Lombardy Cluster Smart Factory, Digital Innovation Hubs) in order to strengthen the level of knowledge and awareness of companies with respect to the opportunities offered by digital transformation. More specifically, Prof. Terzi highlighted the importance of tailoring employees training basing on the organizational level: “at the operators’ level, workers need to be reskilled and we need to support companies in doing this specific training.” At the same time, universities and schools have to teach young people new skills and new competences that companies need. “However, - added Terzi - this is not a complex job. The hardest part is to educate decision-makers [e.g. entrepreneurs, managers].” Indeed, some entrepreneurs do not understand or misunderstand the supporting activities carried out by the technology transfer stakeholders. In other cases, managers wrongly think that their companies have a high digital maturity level, whereas, in reality, they have just started their digital transformation process. Another obstacle is created by middle managers, described by Prof. Terzi as “middle-age people who are usually resistant to any introduction of new innovations because this obliged them to change their working routine. I always said that digital technologies do not imply that anyone must learn how to program in Python and do data analytics. Indeed, there will be someone who already knows how to program in Python and that will do it on your place. However, someone should hire that person and let him do what he learnt.”

3.2 Real digital transformation experience from Camozzi Group

Camozzi Group is an Italian multinational company leader in the production of components and systems for the industrial automation. It is also specialized in the production of special machine tools, textile machinery and in the raw material processing for the heavy and precision machining industry.

The Group is composed by twelve companies and five main business units (automation, machine tools, textile machinery, manufacturing and digital). The company has 18 production sites and around 2,600 employees all over the world. In 2018, Camozzi Group registered 419 million euros of yearly turnover, of which 7% was invested in research and development.

The digital transformation of Camozzi Group started in 2010, when its subsidiary Marzoli, specialized in the production of textile machineries, felt the compelling need to improve its production process management. More specifically, the company needed to control processes remotely and to apply predictive maintenance.

Camozzi Digital, which is the internal department dedicated to Industrial Internet of Things researches, developed a real cyber-physical system [CPS], which is managed by a Cloud platform.

In 2014, the company installed the first fully digitalized textile plant in Turkey, which allowed to reduce maintenance (-15%) and energy costs (-2%) as well as to increase efficiency (+1%) and service life of components (+10%).

This positive experience pushed the entire Camozzi Group towards a digital transformation process that led the company to offer its clients innovative and customized solutions embedded with Internet of Things technology.

However, the creation of innovative and smart solutions depends on the ability of the company to join the internal mechanical and electronics competences of its technicians with IT and robotics developed by universities and research centers.
For this reason, in the last few years, Camozzi was able to make partnerships with digital companies (e.g. SAP, Microsoft, ABB), research institutes and universities (University of Berkeley, Italian Institute of Technology, University of Brescia) for the technological transfer of Cloud, collaborative robots and Artificial Intelligence solutions.

In 2019, Camozzi Group and Politecnico di Milano signed a collaboration agreement aimed at combining specific resources and competences to develop joint research and scientific training initiatives. In particular, the focus is on exploiting opportunities given by the industrial digitization and the use of collaborative robots in the component production processes. Indeed, one of the common objectives is the creation of smart solutions that can be connected to the innovative production process management systems.

Ferruccio Resta, Deputy of Politecnico di Milano, declared that “Camozzi represents a virtuous example of a company that invests in research and enhances the digital transformation processes in the production systems, offering the unique opportunity for students and researchers of the university to work in cutting-edge laboratories”. Indeed, Politecnico students and researches will have the possibility to test their projects in the new laboratories and offices located in Camozzi Research Centre in Milan.
4. **THE IMPACT OF CORONAVIRUS ON INDUSTRY 4.0**

In order to limit the spread of coronavirus and deal with the relative health crisis, the Italian government was forced to impose the temporarily closure of all the business activities, with the exception of food and pharmaceutical supply chains, energy etc. which remained always active to guarantee citizens essential goods and services.

These measures that took effect on March 8 led to a double negative shock for the Italian industrial production, affecting both demand and supply at the same time. Domestic and foreign demand for non-essential goods and services collapsed and, in the meanwhile, 60% of companies were obliged to stop their production and the remaining 40% continued to work at reduced rate.

Please refer to *Wirtschaftsbericht Italien* for the latest economic forecasts and more information on the economic impact of Coronavirus crisis in Italy.

To face the economic crisis, the Italian government strove to establish prompt and effective economic policy measures aimed at preserving the country’s productive context and preventing that the deep recession could trigger a lengthy depression. The first intervention to bolster the economy and the social system was the *Cura Italia* decree (Decree Law n. 18 of 17 March 2020), which is expected to mobilize over 350 billion euros. A second intervention, called *Liquidity Decree*, establishes a package of measures designed to help Italian businesses survive the dramatic short term effects of COVID-19. It is supposed to generate about 400 billion liquidity aid, of which half are allocated to the domestic market and half to exports. Overall, the first two decrees will inject 750 billion euros into the economy, nearly half of Italy’s GDP.

On May 14th 2020, the Italian government presented its 155-billion-euro *Decreto Rilancio*, which has paved the way for Italy’s concrete recovery. The decree is expected to set aside 25.6 billion euros in aid for workers, 15-16 billion for businesses, 3.25 billion for the health sector, 1.4 billion for higher education and research, 2 billion for tourism and 4 billion euros in tax cuts. In addition, *Decreto Rilancio* has also allocated about 1 billion euros for research and innovation:

- 500 million euros to set up of a new Technology Transfer Fund
- 50 million euros to set up a new Technological Innovation and Digitalization Fund
- 20 million euros to set up a new technological center for research, innovation and technological transfer in the automotive sector
- 200 million euros to the Fund for Venture Capital
- 10 million euros in grants for startups
- 100 million euros to Smart&Start fund
- 4 million euros to ease loan access for gaming startups

4.1 **How Italian companies are responding to the coronavirus crisis**

The suspension of non-essential business activities was intended to reduce the concentration of human presence in the same working spaces. To safeguard and protect the health of all workers while guaranteeing business continuity as much as possible, service and manufacturing companies strove to perform their activities online by introducing smart working. A number of employees could profit from tools, data and files in the cloud to work at home, however a number of production activities cannot be performed digitally.

Coronavirus outbreak has highlighted the importance of investing in new digital industrial technologies, because they enable not only business continuity, but also the creation of a competitive advantage. For example, the packaging machineries of IMA are integrated and interconnected through remote monitoring sensors that enable predictive maintenance programs and avoid blocking production and preempt breakdowns. This reduces the risk of clients, including food and pharmaceutical companies, to stop their production lines in case of packaging machines problems. Moreover, IMA continued to provide clients with remote assistance and maintenance services also abroad.

Despite the uncertain situation, the company decided not to stop, but rather accelerate its digitization process. As stated in a press release by Alberto Vacchi, IMA Group Chairman and CEO: “Our answer to this crisis is in
fact to innovate and respond to such difficulties by putting in place all our skills to find smarter solutions in real time.”

Besides an outstanding creative thinking, Italy has showed an exceptional solidarity and an extraordinary resilience during coronavirus crisis. Lots of companies, universities, research centers and associations joined the government call for action “Innovate for Italy” and the international call for sanitary equipment launched by the Lombardy Regional Government for the supply of medical devices needed for the prevention, diagnostics, monitoring and containment of the spread of coronavirus.

Manufacturing companies, such as Fiat Chrysler Automobiles, Ferrari, Magneti Marelli, Automobili Lamborghini, reconverted some departments of their production plants to produce and supply surgical masks, protective medical shields and pulmonary respirators for the intensive care of coronavirus patients. Startups and creative makers were also committed in finding smart, effective and immediate solutions to fill the shortage of medical equipment. More information can be found in the newly published Branchenreport zur Kreativwirtschaft.

For instance, in order to fix the shortage of masks for sub-intensive therapy, the Italian startup Isinnova developed the idea of a physician to transform Decathlon diving mask into emergency ventilators. The result was the creation of a new component, called Charlotte valve, needed to connect the mask to the ventilator. After being successfully tested at Isinnova and then on ICU [Intensive Care Unit] patients, the Charlotte masks were printed and assembled in order to be sent to hospitals in the province of Brescia. Even if the company decided to patent the link valve, the file for its realization in 3D printing is freely available, so that any healthcare facility in need can use this solution if necessary.

Italian universities and research institutes launched different solidarity projects, thus proving their wish to give a quick and concrete help to doctors and operators at the forefront in the fight against coronavirus. For example, the Department of Chemistry, Materials and Chemical Engineering “Giulio Natta” at Politecnico di Milano produced tons of hand sanitizer solution, called “Polichina”, which was provided for free to municipalities, civil protection and local health authorities in Lombardy. Moreover, this technical university collaborated with Lombardy Regional Government for the development of “Polimask” project, which consisted in building up a supply chain for the production of surgical masks, in order to fill their shortage in Lombardy. The university was able in no time to identify 10 materials suitable to protect against COVID-19 out of 500 tested and select those companies having all the requirements needed to convert their production system for the supply of masks out of more than 1700 candidates. Afterwards, the university decided to support the production of other critical care products, like hospital gowns and ventilators, by testing materials, defining suitable companies and helping them to switch their factory operations.

Italian Institute of Technology (IIT) also contributed to fight COVID-19 by sharing its technical and scientific know-how for the development of ideas and solutions to support the health emergency. For this reason, it published on its website a call for action aimed at companies willing to convert their facilities to produce masks and other medical devices. This project is promoted by Liguria Regional Government and supported by business associations, such as Confindustria, Confartigianato and CNA, and by companies, including Rina Group.

Beyond providing smart solutions to deal with the health emergency, universities, such as Politecnico di Milano and Politecnico di Torino, collaborated with the relative regional governments, companies and business associations to support the development of a safe and sustainable plan for the “Phase 2”, namely the one when production activities would gradually reopen in compliance with the preventive measures against the coronavirus spread. Their reports aimed at suggesting directions and methodologies not only to regions, but also to the committee appointed by the Italian Prime Minister Giuseppe Conte to drive Italy towards the delicate Phase 2.

4.2 The future of supply chains
Coronavirus outbreak impacted differently on industries, thus defining three main categories: the “losers” (i.e. sectors that will suffer), the “winners” (i.e. sectors that will benefit), and the “inbetweeners” (sectors that could go either way depending on how they respond).
Airlines, trains and cruise ships, automotive, construction, tourism, hospitality and related industries will probably suffer a deep crisis, or even a collapse. The traditional retail may not recover, after the pandemic forced even the most reluctant consumers to shop online. Moreover, traditional entertainment [i.e. cinemas, theaters, theme parks, sporting events, restaurants and bars] is seriously affected, thus stimulating entrepreneurs to change their business model, also in order to decrease the real or perceived risk of infection.

If the traditional physical world loses, the technological one wins: high-tech, e-commerce, telecommunications, entertainment via streaming and video conferencing are experiencing record volumes. Despite the slowdown in international trade, freight forwards and couriers will grow due to the increasing demand for home deliveries.

Manufacturing can be considered as an “inbetweener”. If manufacturers maintain pre-coronavirus conditions, they may struggle. However, if they are agile in exploiting new emerging opportunities and in changing business model, they will survive. Indeed, coronavirus outbreak demonstrated that digital transition and investments in people’s digital literacy are essential to avoid suspending operations. In the future, robotics will be increasingly used to reduce risks linked to labor-intensive productions and to guarantee business continuity, while non-core activities (e.g. HR and finance) will be mainly carried out remotely.

Moreover, research and development investments will be increasingly necessary to create products and processes suitable for a post-coronavirus world, which will be different from the current one. Technology would be no more considered as enabling factor to grow more, expand business, streamline practices, but rather a turning point. Virtuous companies that have invested in digital transformation process will have an edge, and speed would be key to transform this contingency into a strategic advantage. Entrepreneurs need to react quickly, also by changing work and organizational models in order to encourage smart working and smart training at all levels, to fill employees’ gaps and to develop new advanced technical, soft and problem solving skills. The involvement of workers in this digital transformation process can bring out talents gifted with skills, motivation and tenacity to relaunch the business.

To face the coronavirus crisis and accelerate the digital transformation process, companies should join innovative ecosystems, where they can collaborate together with other enterprises, startups, clusters, Digital Innovation Hubs, competence centers, universities and research institutes. In this way, it is possible to pool the efforts and to create more profitable innovative solutions with lower costs, time, and risks.

Coronavirus crisis has also highlighted the risks and downsides of relying on extensive international and integrated supply chains. Companies are experiencing the so-called butterfly effect: as the flapping of a butterfly’s wings causes a hurricane on the other side of the world, a negative shock on one actor is enough to hit all the supply chain. This awareness may lead to a redesign of the actual supply chains, thus pushing towards a reshoring process.

Conversely, Marco Taisch, president of MADE Competence Center and Full Professor at Politecnico di Milano, considered that reshoring is not a solution for the fragility of actual global supply chains. As declared in an interview to the magazine Este on 6 March 2020, “I do not think that China will stop being the factory of the world”. Instead, “I believe that the events of these weeks have highlighted what we disclosed in 2018 at the World Manufacturing Forum, namely that global and highly connected supply chains are more exposed to risks. Natural disasters or epidemic events amplify their reach and spread throughout the supply chain”.

Therefore, the question is: can the effects of this critical phenomenon be contained? “We can contain the effects – said Taisch – but the supply chains must be designed in such a way as to be more resilient to unexpected phenomena: the earthquake yesterday, the virus today, tomorrow we can expect events related to natural disasters. And, to face them, I don’t think the solution is necessarily reshoring. Firms should equip themselves to tap into alternative sources of supply. This is not easy to achieve if a cost reduction policy is pursued. Companies need to choose whether to have robust, and therefore more expensive, supply chains or to stress cost reduction. This second solution will lead to more fragile supply chains that are unprepared to handle unexpected events. And this is the phenomenon that we have under our eyes these days”.

As a matter of fact, industrial companies generally know their Tier 1 suppliers well, but they usually have little to no knowledge of suppliers further up the chain. In order to make supply chains more resilient to future
shocks, companies should increase their visibility along the chain. This will bring different benefits, including a higher efficiency and agility of the supply chain during normal production. Moreover, it can help companies to understand the impact of a supply chain disruption, so that they can promptly plan and develop alternative suppliers.

Visibility can be achieved through the three key factors:

- Digitization of supply chain processes that currently rely on information in paper documents (e.g. the Bill of Lading”) can make data available through digital means, thus increasing visibility and limiting supply chain risks.
- Blockchain will help ensure data privacy for suppliers. Upstream suppliers are usually not forthcoming with the information concerning their operations, pricing and sourcing, as they are afraid of losing their commercial advantage to customers. However, blockchain allows companies to control exactly who receives what data from them, and independently verify such controls. In this way, suppliers will be more willing to uncover their data and to participate in supply chain visibility initiatives.
- Supply chain finance programs can be a cost-efficient and profitable method to incentivize suppliers to share their data, as they can get an easier access to financing at the buyer’s own competitive interest rates. Buyers, in turn, can pay suppliers later, reduce cost of goods sold, and insulate themselves from supplier bankruptcy.

To recover the unusual and massive shock caused by COVID-19, the most effective action is implement supply chain finance programs to support suppliers in financial straits. If these programs are accompanied with data sharing, companies will be more easily updated about coronavirus situation changes and more resilient to deal with a future shock. However, supply chain initiatives take time to roll out, therefore they should be launched early.

In summary, digital industrial technologies accompanied with enabling policies can help rebuild a more responsive and shock-proof supply chains in the decades to come.
5. INVESTMENT POLICY AND PROMOTION

In response to the challenges faced by companies in adopting new advanced digital technologies, the Italian government established industry 4.0 policies, aimed at increasing productivity and competitiveness and improving the high-tech skills of their workforce.

Industry 4.0 National Plan [Piano Nazionale Industria 4.0] was launched in February 2017 by the Italian Ministry of Economic Development. The plan included industry 4.0 policies mainly focused on incentivizing the substitution and the modernization of the production assets and plants of the manufacturing industry. The most important measures included in the plan were:

- **Super-depreciation** (Superammortamento): it was an incentive for depreciation purposes, where the investment value is temporarily overvalued. It was applied both for purchases and lease purchase agreements.

- **Hyper-depreciation** (Iperammortamento): it was an incentive similar to super-depreciation, but it was applied to investments in new high-tech tangible assets, devices and technologies enabling companies’ transformation towards industry 4.0.

- **Nuova Sabatini law**: it consisted of a favored admission to a bank loan and a direct contribution to cover the interests on the loan. This incentive was available to all companies interested in upgrading industrial plants, buying new machinery and equipment, investing in hardware, software and digital technologies.

- **Patent box**: it was an optional facilitated fiscal system applicable on IP-related income, such as industrial patents, industrial designs, know-how and software protected by copyright.

- **Tax credit for R&D expenses**: it was calculated on the basis of the average expenditure on Research and Development in the years 2012-2014. This measure is applicable to Research and Development expenditures incurred in 2017-2020 period.

- **Guarantee fund**: its aim is to sustain SME which have problems in credit access. It consists in the granting of a public guarantee, up to a maximum of 80% of the loan, either to meet liquidity needs or to make investments.

All the aforementioned policies created a positive environment for innovative business in Italy in 2017, characterized by low taxes on new investment, particularly on research and digital assets. According to the Digital Tax Index 2018 elaborated by PWC, Italy ranked as the most favorable country worldwide for investment in digital business models, with an effective average tax rate, or EATR, of -33.18%.

In order to support SMEs in their digital transformation process and to facilitate the cooperation between industry, research and public authorities, the National Plan on Industry 4.0 plan included the creation of an Industry 4.0 National Network composed by three main infrastructures: Digital Business Hubs (Punti d’Impresa Digitale or PdI), Innovation Hubs and Competence Centers.

Moreover, since 2017, the Italian Ministry of Economic Development has rewarded those private research institutes and companies providing SMEs with training, consultancy and technology transfer services on industry 4.0 technologies (e.g. additive manufacturing, augmented reality, Internet of Things, Cloud Computing, cybersecurity and Big Data Analytics) by certifying them as “technology transfer centers”. The list of the certified technology transfer centers, including Fondazione Bruno Kessler and Cefriel scarl of Politecnico di Milano, is periodically updated by the Italian Chamber of Commerce Unioncamere.

As the Industry 4.0 plan represented a positive shock for the Italian manufacturing industry, in September 2018, the Italian Ministry of Economic Development launched a new national plan called Enterprise 4.0 (Impresa 4.0), which extended fiscal incentives also to service companies and which encouraged companies to do training courses on their employees, as this is a necessary step to exploit all the opportunities and advantages provided by digital technologies. The previously mentioned incentives were re-established and other initiatives were set up, including development contracts, innovation agreements, tax credit for industry 4.0 “on-the-job-training”, funds for innovative startups and SMEs (Small and Medium Enterprises), funds for the protection of intangible
assets (e.g. patents, brands and drawings). More details on Enterprise 4.0 plan and its measures are available here.

In December 2019, the Italian parliament approved 2020 Budget Law (no. 160/2019), which introduced and extended a series of incentives for companies at national level (e.g. tax deduction, financial contributions, accelerated depreciation, tax credit). In particular, beyond re-funding some already-existing measures, it has launched a new industry 4.0 plan, called Transition 4.0 (Transizione 4.0), and Italy’s Green New Deal, which focuses on growth and environmental sustainability.

The two plans are described in details in the following two chapters.

5.1 Transition 4.0 plan

Transition 4.0 plan is the new governmental program that aims at supporting Italian companies towards digitization and industrial upgrading.

As written by the Italian Minister of Economic Development Stefano Patuanelli in a letter published by the newspaper Il Sole 24 Ore on 18th December 2019, the results of the previous government plan (Enterprise 4.0) highlighted improvements as well as some critical issues. Indeed, the value of all the investments in tangible and intangible assets connected to 4.0 technologies resulted to be around 13 billion euros. However, only about 53,000 companies, of which two thirds were medium and large-sized enterprises, benefited from the available incentives. Over 1 million companies used Super Depreciation on tangible assets, especially for buying machineries, totaling an expense of 10 billion euros, whereas only 3 billion euros were invested in intangible assets. Moreover, only 95 Italian companies invested in assets valued over 10 million euros, while just 233 enterprises have been developing R&D projects with a value higher than 3 million euros.

These results achieved by Enterprise 4.0 led to the definition of a new plan, called Transition 4.0, whose main objective is to enlarge the share of potential enterprises that can benefit from these measures, forecasted in +40% especially among SMEs. Moreover, after the compelling requests coming from entrepreneurs, associations and industry experts, the government has established a tree-year plan (2020-2022) in order to reduce uncertainty and favor medium and long-term investments.

Transition 4.0 plan introduces three tax credits for Italian and foreign companies (with at least a branch located in Italy) willing to:

- buy and/or lease new tangible and/or intangible assets
- invest in research and development
- invest in training concerning digital matters.

The first tax credit replaces Hyper Depreciation and Super Depreciation, which were the most popular incentives of Industry 4.0 and Enterprise 4.0 plans. The change of the incentive provision from depreciation deduction to tax credit was approved by the majority of the experts. Indeed, the new method allows a rationalization and simplification of legislation as well as an easier incentive access to startups and new business ventures. Moreover, the tax credit can be remunerable in 5 years, starting from January of the year after the investment. This will lead to a reduction of the incentive payback period, especially for tangible assets, if an average amortization period of 8 years is considered.

The following tables show the new tax credits for the purchase and lease of new tangible and intangible assets.
Table 3: Transformation of Hyper Depreciation in tax credit for expenses related to industry 4.0 high-tech assets (Annex A law 11 December 2016, n. 232)

<table>
<thead>
<tr>
<th>Investment ceiling</th>
<th>Tax credit rate (in %)</th>
<th>Annual tax benefit (in %) over 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Till 2.5 million euros</td>
<td>40%</td>
<td>8%</td>
</tr>
<tr>
<td>Exceeding part of 2.5 million euros and till 10 million euros</td>
<td>20%</td>
<td>From 5% to 8%</td>
</tr>
</tbody>
</table>

Source: MISE, presentation of Transition 4.0 plan (2019).

Table 4: Transformation of Super Depreciation in tax credit for tangible assets

<table>
<thead>
<tr>
<th>Investment ceiling</th>
<th>Tax credit rate</th>
<th>Annual tax benefit (in %) over 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Till 2 million euros</td>
<td>6%</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

Source: MISE, presentation of Transition 4.0 plan (2019).

Table 5: Transformation of Hyper Depreciation in tax credit for investments in intangible assets (listed in Annex B law 11 December 2016)

<table>
<thead>
<tr>
<th>Investment ceiling</th>
<th>Tax credit rate</th>
<th>Annual tax benefit (in %) over 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Till 700 000 euros</td>
<td>15%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: MISE, presentation of Transition 4.0 plan (2019).

Transition 4.0 plan focuses its incentive measures on technological innovation in order to favor digital transformation, circular economy and environmental sustainability. For this reason, the plan includes tax credits for R&D expenditures, including basic research, applied research and experimental development in industrial and design-related sectors.

Tax credits rates and the eligible industries are shown in the following table.

Table 6: Tax credits for research and development expenses

<table>
<thead>
<tr>
<th>Investment ceiling</th>
<th>Tax credit rate</th>
<th>Type of investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Till 3 million euros</td>
<td>12%</td>
<td>Industrial research and development investments</td>
</tr>
<tr>
<td>Till 1.5 million euros</td>
<td>6%</td>
<td>Technological innovation investments aimed at creating new or substantially improved products or production processes</td>
</tr>
<tr>
<td>Till 1.5 million euros</td>
<td>10%</td>
<td>Technological innovation investments aimed at achieving either an ecological transition or digital innovation 4.0 goal</td>
</tr>
<tr>
<td>Till 1.5 million euros</td>
<td>6%</td>
<td>Investments in design and aesthetic ideation activities for the conception and realization of new products and samples in the textile and fashion, footwear, eyewear, goldsmith, furniture and furnishing and ceramic sectors</td>
</tr>
</tbody>
</table>

Source: MISE, presentation of Transition 4.0 plan (2019).

Transition 4.0 plan reestablished in 2020 tax credits for expenses concerning employees training on digital matters. The aim is to fill the skill gap of workers on new digital industrial technologies. Indeed, companies do not
only need to acquire qualified personnel perfectly capable of using digital and innovative machineries and tools, but also to keep employees’ skills up to date.

The following table shows the relative tax credits rates basing on the company size. In particular, the percentage is increased up to 60% in case of training on employees belonging to some specific categories, as defined by the Ministry of Labour and Social Policies in the decree dated 17th October 2017.

Table 7: Tax credits for training expenses in digital matters

<table>
<thead>
<tr>
<th>Yearly investment ceiling</th>
<th>Tax credit rate</th>
<th>Type of investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Till 300 000 euros</td>
<td>50% of the labour cost concerning the number of hours / days of training</td>
<td>Training expenses in digital matters for small enterprises</td>
</tr>
<tr>
<td>Till 250 000 euros</td>
<td>40% of the labour cost concerning the number of hours / days of training</td>
<td>Training expenses in digital matters for medium enterprises</td>
</tr>
<tr>
<td>Till 250 000 euros</td>
<td>30% of the labour cost concerning the number of hours / days of training</td>
<td>Training expenses in digital matters for large enterprises</td>
</tr>
</tbody>
</table>

Source: MISE, presentation of Transition 4.0 plan (2019).

As a consequence of the stop of production activities due to the coronavirus health crisis, companies postponed their investments, thus making little use of the financial resources of the Transition 4.0 Plan. In order to encourage companies to invest in digital innovation, the Italian Ministry of Economic Development published a proposal to rearrange the unused resources of the first half of 2020 in order to focus them in the second half of the year. This could lead to a doubling of the tax credit rates for research and development expenses and an increase of ceiling and tax credit rates for investments in new assets. However, this proposal to change Transition 4.0 plan may not be implemented, as a very huge amount of resources (i.e. 155 billion euros) has been allocated by the government for Decreto Rilancio.

5.2 Green New Deal

Environment sustainability, energy efficiency, sustainable mobility and urban design are the key topics for the Conte II Cabinet. In 2019, the Italian Ministry of the Environment has set up a commission that is in charge of studying and drafting up proposals for the redefinition of the subsidy system in the freight, naval and air transport sector by the end of October 2020. Its mission is to identify and cut those subsidies that indirectly encourage pollution and, at the same time, use a part of the economic-financial resources recovered to incentivize research and technological innovation investments that will lead to a reduction of the carbon emissions by the end of 2030.

As established in 2020 Budget Law, Italy’s Green New Deal involves a fund of over 20 billion euros for the period 2020-2034, to relaunch public investments in the circular economy, decarbonization and the reduction of emissions. In 2020, the total amount of available resources are 1438 million euros, of which:

- 435 million euros for public investments and innovative projects in circular economy, low-carbon economy and environmental sustainability;
- up to 500 million euros per year of contributions to municipalities for public investments aimed at increasing energy efficiency and sustaining territorial development;
- 33 million euros per year as financial contributions to the international Green Climate Fund;
- 470 million euros to Green New Deal Fund, in order to boost development and investments in environmental sustainability, circular economy, low-carbon economy. The Italian Ministry of Economic Development can subsidize up to 80% of loans used to support specific green investment programs. In particular, projects must be aimed at realizing highly innovative and environmentally sustainable solutions, where social aspect (e.g. support for youth and female entrepreneurship) is also considered. In addition to subsidized loans, the eligible projects could benefit from a non-repayable contribution up to a maximum of 15% of the investment expenses. The Minister of Economic Development with the Minister of
Economy and Finance will establish terms, conditions and methods of granting grants soon. The total resources available of this fund are 4.2 billion euros for the period 2020-2023.

As established by 2020 Budget Law, “Nuova Sabatini” Law was re-subsidized in order to further encourage SMEs to invest in environmentally sustainable assets. Indeed, the measure incentives the purchase or the lease of new factory machinery, plants and equipment with low environmental impact through an eased admission to a bank loan and a direct contribution to cover loan interest. The measure is dedicated to Italian and European companies, as long as they are planning to open an operating office in Italy within the deadline of the completion of the investment.

Moreover, the government re-confirmed for 2020 Eco-bonus, which consists of a 50% deduction for energy requalification (windows, fixtures, solar screens) of the individual buildings and 65% deduction for other types of intervention [replacement of winter air conditioning systems with Class A condensing boilers]. However, in order to relaunch the economy, Decreto Rilancio introduced stronger incentives, up to 110% of costs incurred in relation to seismic safety and upgrading the energy efficiency of buildings in Italy.

Considering a long-term view, the government will also allocate 5.5 billion euros for the period 2021-2034 to regions that will invest in building and environment security, drivability, ecological public transport systems, urban regeneration and energy conversion towards renewable sources, social infrastructure and environmental decontamination of polluted sites.

5.3 Other incentives

Beyond Transition 4.0 plan and Green New Deal, government established other measures, including the National Innovation Fund (Fondo Nazionale Innovazione), which is an asset management company that exclusively operates through the so-called Venture Capital methodologies. Its aim is to collect all the public and private resources in order to invest in innovative startups and SMEs that deals with Artificial Intelligence, Blockchain, New Materials, Aerospace, Healthcare, Eco-Industries, Agri-Tech/Food-Tech, Mobility, Fintech, Design/Made in Italy, Social Impact. The budget available for this measure is 1 billion euros.

Moreover, the Italian Ministry of Economic Development decided to re-subsidize “Innovative Machineries” call. This measure aims at supporting the development of projects concerning digital technologies and environmental sustainability in production plants located in the less developed regions of Italy (Basilicata, Calabria, Campania, Puglia and Sicilia). It is addressed to all SMEs and business networks of the industrial sectors, except for steel, coal extraction, shipbuilding, transport, energy production and distribution industries. Companies can benefit from grants relating to property, plant and equipment and an eased admission to a bank loan in order to buy new machineries, plants and equipment as well as IT system and licences, whose costs must range between 400,000 euros and 3 million euros.

Italian government allocated 50 million euros for the protection of patents, brands and drawings as well as the technological transfer of the R&D activities carried out by companies, universities and research institutes. Stefano Patuanelli stated that “in the next months, the objective is to give financial and legislative tools that will give stability and certainty both to companies investing in know-how and to research centres involved in R&D projects to be transferred to the industrial sector”.

SMEs can send their applications related to patents (Bando Brevetti+), drawings (Bando Disegni+) and brands (Bando Marchi+) starting from 30 January, 27 February and 30 March 2020 respectively.

2020 Budget Law re-subsidizes “Young Work Bonus” (Bonus Lavoro Giovani), which incentivizes employers to hire young workers under 35 years old with a permanent contract through a total exemption from pension contributions.

In 2019, the Ministry of Economic Development (MISE) introduced new measures, including the fund for emerging technologies, to support experimentations in Artificial Intelligence, Blockchain and Internet of Things technologies.
Moreover, a great novelty introduced in 2019 is the Voucher for consultancy in innovation, better known as voucher for innovation manager, which consists in a non-repayable grant that SMEs can use to purchase specialist consultancy services aimed at supporting them in their digital and technological innovation projects. Indeed, the voucher is intended to cover the costs of the Innovation Manager’s service (up to EUR 80.000), which must be temporarily employed with a consultant agreement lasting between 9 and 15 months. Innovation Manager has the aim of leading projects concerning one of more Key Enabling Technologies, such as Big Data and data analysis, Cyber Security, Virtual and Augmented Reality, Advanced and Collaborative Robotics, integration and digital development of business processes, digital marketing, open innovation programs. The list of the innovation managers certified by MISE can be found here.

The financial resources allocated for the implementation of the measure amounted to 75 million euros, broken down by each of the years 2019, 2020, and 2021.

Focus: The role of innovation managers
During an interview on 20th December 2019, Alessandra Luksch, Director of Startup Intelligence and Digital Transformation Academy Observatory at Politecnico di Milano, declared that she conceives the role of the innovation manager as a hybrid figure between Indiana Jones and Mary Poppins.

“Both these fictitious characters have to manage changes, but with different approaches. Indiana Jones has the ability to anticipate a mysterious future and he is never discouraged after some failures, as he always finds the strength and the courage to go ahead. Conversely, Mary Poppins is a character well known for its creativity, its ability to find unexpected ideas and solutions. She has also a great sensibility, which the innovation manager must have too. Indeed, he must not impose his tools and his methodology, but he should adapt himself basing on the company characteristics in order to better encourage people to be creative.”

This metaphor summarizes the three main roles each innovation manager has to undertake: he has to be an explorer, because he needs to find innovation opportunities for the company. Then, he should be an “evangelist of innovation” or a change manager, because he deals with the introduction and development of an innovation culture throughout the organization. Finally, he is an enabler for conducting managerial activities, such as analysis and evaluation of results, introduction of new methodologies and project portfolio management.

As stated by prof. Luksch, innovation manager is a complex role for two main reasons: on one side, this role is not clearly defined yet, while, on the other side, its main objective is to change the way the company works. He needs to have both technical skills, which concern technology, processes, management and financial markets, and above all the soft ones, especially leadership, strategic view, creativity and curiosity. Indeed, he has to daily manage hostile organizational contexts, where it is difficult to introduce changes. Moreover, he should be flexible, in order to transform himself basing on the company environment and culture.

However, the role of the innovation manger is not always compulsory. Prof. Luksch mentioned as an example Google and Amazon, which do not need to hire innovation managers because “they have always embedded the innovation culture in their employees. They are digital native companies, as they imposed digital transformation process to all the other enterprises.”

Conversely, “innovation managers are needed to companies which undergo this digital transformation process. They cannot impose their ideas, but they should act as evangelists. The bigger the company, the more the role of the innovation manager is needed. Indeed, small companies can train their ten employees without the need of an innovation manager. Instead, big companies need a reference figure which helps them from a methodological point of view.”

Prof. Luksch concluded the interview by summarizing the three main reasons why an innovation manager is needed in a company:

1. Innovation is a complex process, which implies a favorable culture. When it is missing, it is necessary to designate someone that promotes experimentation and acceptance of failure as an inevitable step to achieve success;
2. The market is rapidly evolving and someone has to promote innovation and anticipate clients’ needs to offer suitable products and services;

3. Innovation is not only technology, as it concerns not just new products or services but also new business models based on customer needs and on criteria of efficiency and flexibility.

Focus: The real experience of an innovation manager

During the conference 2020 Digital Innovation: enterprises and startups towards open company organized by Digital Transformation Observatories of Politecnico di Milano on 3rd December 2019, Marco Banfi, CIO & Digital Innovation Manager of BNP Paribas Leasing Solutions Italy, explained his experience as innovation manager in this company using a metaphor: “I am not a real innovation manager, I am a secret agent and I’ve always made fun of you pretty well. To keep my cover, I attended all the conferences of PoliMi (Politecnico di Milano) Observatories to catch new ideas, in order to give more credibility to my role. Now, my idea is to say everything, to disclose even the tricks”.

The first advice suggested by Mr. Banfi to innovation managers is “to create an international team of agents that have the competences that you don’t have so that they can investigate in every corner of the organization”. Groups leveraging on a plurality of competences and abilities come up with a higher number of creative ideas compared to similar groups as team members have different opinions and perspectives. For this reason, the innovation manager’s objective is to increase the attention of people towards innovation, which should be seen as a learning process and not something to be passively accepted. The process of continuous and incremental change should be focused and oriented by management, but always based on efforts, ideas and motivation of all employees, including people at the operational level. However, the creation of a new culture is a long and complex process, because people are resistant to change. According to the researchers conducted by Digital Transformation Academy of Politecnico di Milano in 2019 and presented by Prof. Mariano Corso during the conference, 62% of the innovation projects fail in reaching the pre-established goals due to a low engagement of personnel (44%), a close change culture in the company (41%) and a low sponsorship of innovation projects from the top management (35%).

To lower these barriers, Prof. Mariano Corso suggested that innovation managers create a sense of urgency for change, while reducing fear and anxiety. Moreover, they should establish an agile organization, where anyone is involved in the change management projects. For example, innovation managers can organize informal events, where ideas can be freely proposed without being judged. This solution is also adopted by Mr. Banfi, that established “digital breakfasts” to enable different teams to present their innovative projects. Moreover, he disclosed that he secretly checks meetings of other colleagues “in order to slip in those where I can be useful (even if they do not always let me in)”. This is because innovation managers should always “listen and spy on conversations to catch the real needs of the company.”

Finally, Mr. Banfi concluded by suggesting managers to keep in mind that “an innovative idea is not based on the current available budget, but on the value it could generate in the future.”

5.4 Regional incentives

Thanks to regional, national and European funds, different regions have been setting and providing policies targeted to manufacturing enterprises and aimed at stimulating local economic system and encouraging employee recruitment.

The following table lists a selection of available funding programs established by the Piedmont Regional Government for the industrial sector.
Table 8: Current measures established by Piedmont Regional Government for industrial sectors

<table>
<thead>
<tr>
<th>Name</th>
<th>Target</th>
<th>Explanation</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition of companies in crisis and/or of production plants closed or at risk of closure</td>
<td>Italian or foreign companies</td>
<td>It consists of a non-repayable grant for the acquisition of production plants, research institutes or companies already closed or at risk of closure located in Piedmont.</td>
<td>Finpiemonte</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ 39 011 57177111</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E <a href="mailto:info@finpiemonte.it">info@finpiemonte.it</a></td>
</tr>
<tr>
<td>Energy efficiency and renewable energies</td>
<td>Companies located in Piedmont established by at least 2 years</td>
<td>It consists of a non-repayable grant covering up to 100% of energy efficiency expenditures starting from EUR 50,000.</td>
<td>Finpiemonte</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ 39 011 57177111</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E <a href="mailto:info@finpiemonte.it">info@finpiemonte.it</a></td>
</tr>
<tr>
<td>Settlement of big enterprises in Piedmont</td>
<td>Big-sized companies, in collaboration with SMEs and research centers</td>
<td>The measure aims at attracting foreign direct investment in Piedmont. It consists of a grant for the creation of new production plants and the development of industrial R&amp;D projects in Piedmont.</td>
<td>Finpiemonte</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ 39 011 57177111</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E <a href="mailto:info@finpiemonte.it">info@finpiemonte.it</a></td>
</tr>
<tr>
<td>Attraction and rooting of new investments in Piedmont (&quot;A line&quot;)</td>
<td>SMEs not yet located in Piedmont or already established in Piedmont, but wishing to back reshoring or to diversify production</td>
<td>The measure incentivizes investments on fixed assets and R&amp;D projects to set up new production plant, office center or R&amp;D institute. It consists of a subsidized loan, covering 100% of the expenses.</td>
<td>Finpiemonte</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ 39 011 57177111</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E <a href="mailto:info@finpiemonte.it">info@finpiemonte.it</a></td>
</tr>
<tr>
<td>Incentives for SMEs investing in Piedmont, creating new jobs (&quot;B line&quot;)</td>
<td>SMEs already supported by &quot;A line&quot; incentive measure</td>
<td>The measure encourages employee recruitment. It consists of non-repayable grant, covering the labour cost ranging from EUR 20,000 till EUR 200,000 for each HR.</td>
<td>Finpiemonte</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>+ 39 011 57177111</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E <a href="mailto:info@finpiemonte.it">info@finpiemonte.it</a></td>
</tr>
</tbody>
</table>

Lombardy leadership in innovation field is the result of many successful measures established in the last years to foster local R&D investments. The starting point was the approval of the regional law No. 29 of 23rd November 2016 (called "Lombardy is Research and Innovation"), which included the design and the implementation of a three-year strategic program (2018-2020) to incentivize research, innovation and technological transfer projects in the region.

Moreover, thanks to the European Regional Development Fund (ERDF), Lombardy Regional Government has provided other incentive measures for SMEs, as listed in the following table.
### Table 9: Current measures established by Lombardy Regional Government for industrial sectors

<table>
<thead>
<tr>
<th>Name</th>
<th>Target</th>
<th>Explanation</th>
<th>Contact</th>
</tr>
</thead>
</table>
| **Now Credit (Credito Adesso)**           | Freelances and companies with less than 3,000 employees, established by at least 24 months and belonging to the manufacturing, business services, construction, wholesale and tourism sectors | It consists of:  
- a loan subsidized by Finlombardia and provided by an affiliated bank  
- contribution that reduces interest rate by 2% (3% and 4% for some categories of companies) | Finlombardia  
+39 02.607441  
www.finlombardia.it  
E infoflbei@finlombardia.it |
| **“AL VIA” corporate investments**        | SMEs registered in the Italian Register of Companies with an operating office in Lombardy at the time of the supply of the contribution, established by at least 24 months | It consists of:  
- up to 15% non-repayable grant for capital expenditures in productive assets for a specific investment project  
- long-term financing from EUR 50,000 to EUR 2.85 Mio. lasting from 3 to 6 years at favorable interest rate  
- free financial guarantee to cover up to 70% of the financing  
The eligible projects must concern either “Company Development” or “Relaunch of Productive Areas”. | Finlombardia  
+39 02.607441  
www.finlombardia.it  
E alvia@finlombarda.it |
| **InnovaLombardia – Research and Development Line for SMEs [2020 FRIM FESR call]** | SMEs registered in the Italian Register of Companies with an operating office in Lombardy at the time of the supply of the contribution; SMEs having an operating office in Lombardy or who intend to establish an operating office in Lombardy no later than the stipulation of the loan agreement | It is a financial support for companies investing in R&D projects aimed at introducing product and/or process innovation. Projects be implemented in Lombardy and refer to aerospace, food, eco-industry, creative and cultural industries, healthcare industry, advanced manufacturing and sustainable mobility. The measure consists of a long-term subsidized loan from EUR 100,000 to EUR 7 Mio. lasting from 3 to 7 years at favorable interest rate. | Finlombardia  
+39 02.607441  
www.finlombardia.it  
E informazioni@finlombarda.it |
| **SIMPLER [Services to foster innovation and competitiveness of Lombardy and Emilia Romagna companies]** | SMEs, research institutes, universities, public administration in Lombardy and Emilia Romagna | SIMPLER is a project co-financed by the European Commission and supported by the regional governments of Lombardy and Emilia-Romagna. It enables the access to services offered by the Enterprise Europe Network (EEN).  
It offers:  
- information and consultancy on market opportunities, legislation and relevant business policies in the European Union | Finlombardia  
+39 02.607441  
www.eensimpler.it  
www.finlombarda.it/simpler  
E simpler2@finlombarda.it |
One of the incentive measures established at the national level but managed by regions are innovation agreements. They financially support innovative and large-scale R&D projects involving many companies, research centers and universities. Their objective is the creation or the noteworthy improvement of products, processes or services.

Among the 32 projects financed by the Lombardy Regional Government, SMART4CPPS (Smart Solution for Cyber Physical Production Systems) aims at drafting the future of Smart Factory through the development of new digital technology applications that will be used by Lombardy machinery and components manufacturers. In particular, companies and universities involved in the project (including Cosberg S.p.A and Politecnico di Milano) developed six practical case studies, where Industry 4.0 enabling technologies are integrated in components, machines and systems, thus creating six different smart cyber-physical systems.

More details on the Lombardy incentives can be found at the following links:

- www.investinlombardy.com
- www.openinnovation.regione.lombardia.it/en/eng.

Other regions, such as Tuscany, Lazio and Emilia Romagna, joined "Retention project" developed by Confindustria Advisory Board of Foreign Investors. The project aims at supporting and increasing the retention and the expansion of foreign companies’ investments through the creation of a customer service available for foreign investors.

After the Coronavirus outbreak, regional authorities and local bodies set up measures for small enterprises and freelances to support the restart of their businesses. In particular, the majority of these incentives focused on easing the access to loans and on reducing interest rates. Beyond liquidity measures, Lombardy Regional Government has allocated 2 million euros for the development of Industry 4.0 Innovative Solutions, while Liguria Regional Government has allocated 3.5 million euros for the purchase of machineries, tangible assets and consultancy services.

Finally, Decreto Rilancio has allocated 12 billion euros to regional authorities and local bodies for the payment of public administration debts to suppliers and service providers.
6. INDUSTRY 4.0 INSTITUTIONS

6.1 Industry 4.0 National Network
In 2016, the Italian Industry 4.0 Plan established the creation of an Industry 4.0 National Network, constituted by different hubs located all around Italy. The aim of this network is to spread and promote an innovation culture based on Industry 4.0 (I4.0) competences, as well as to support companies in their digital transformation process, through the following activities:

- Conveying advantages and opportunities of investing in I4.0 technologies;
- Strengthening and diffusion of skills concerning I4.0 technologies;
- Understanding the digital maturity level and identifying priority areas for interventions;
- Company orientation towards the most suitable competence center and/or technology transfer center depending on the identified needs;
- Encouraging and supporting companies in conducting industrial researches and experimental development projects.

The Industry 4.0 National Network consists of:

- **77 Digital Business Hubs** [Punti d’Impresa Digitale or PID], which are managed by the Italian Chambers of Commerce Unioncamere. They offer companies basic I4.0 concepts and an assessment of the digital maturity level. According to the result obtained and the digital needs identified, they orient companies towards innovation hubs, competence centers and/or technology transfer centers.

- **100 Innovation Hubs**, which are managed by the most important Italian trade associations [e.g. Confindustria, Confcommercio, Confartigianato, CNA]. Their services consist in assessing the digital maturity level of companies and, basing on their digital needs, providing basic training courses on specific technologies and digital solutions. Moreover, they coordinate their activities with competence centers and technology transfer centers to orient enterprises towards the most suitable hub.

- **8 Competence Centers** [Centri di competenza ad alta specializzazione], which are public–private partnerships financed by the Italian Ministry of Economic Development, universities and private companies. Each competence center focuses on specific I4.0 technologies and sectors in order to offer companies a highly specialized support in carrying out advanced training and industrial R&D projects.

Companies can freely choose the hub of the network to contact first according to their needs.

Figure 15: Summary of the Industry 4.0 National Network established by the Industry 4.0 Plan
Figure 16: Summary of the services offered by the different hubs of Industry 4.0 Network

<table>
<thead>
<tr>
<th>Activities</th>
<th>PID</th>
<th>Innovation Hubs</th>
<th>Competence centers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spread Industry 4.0 (I4.0) culture</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Map of the digital maturity level of companies</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training courses on basic 4.0 competences</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orientation towards Innovation Hubs and Competence Centers</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training courses on specific 4.0 technologies applied to sectors</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orientation towards the most suitable Competence Center and/or technology transfer center</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced training courses at demo productive lines</td>
<td>✔</td>
<td></td>
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<tr>
<td>Development of industrial R&amp;D projects concerning 4.0 technology</td>
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**Focus: Competence Centers**

Competence centers are one of the most important pillars of the Industry 4.0 National Network established by the National Industry 4.0 plan, which conceived them as public-private partnerships, meaning that they are financed both by government agency and by research institutes, universities and private companies.

As established in 2018 Budget Law, the Italian Ministry of Economic Development allocated to competence centers 47.5 million euros to cover startup costs and 25.5 million euros to finance applied research & technology development projects (up to a maximum of 200,000 euros per project). Indeed, the mission is to support private-sector companies in the development of innovative industrial R&D projects aimed at creating and/or improving products, services and/or processes through the application of advanced 4.0 technologies.

In order to reduce development costs and exploit scale economy, each of the eight competence centers covers the entire Italian territory (MAP), but they are specialized in a specific Smart Technology, which was selected according to the competences and know-how characterizing the territory they are placed:

- **MADE** (Made in Italy - Milan) focuses on digital technologies applied to the manufacturing sector;
- **CIM 4.0** (Competence Industry Manufacturing 4.0 - Turin) focuses on Advanced Manufacturing technologies and on aerospace and automotive sectors;
- **SMACT** (Venice) focuses on food, clothes, furniture and automation sectors;
- **START 4.0** (Genoa) focuses on security, safety and cyber security for harbor, transport, energy and water infrastructure sectors and for production systems;
- **BI-REX** (Bologna) focuses on the service industry;
- **ARTES 4.0** (Pisa) focuses on Advanced Robotics and enabling digital technologies & systems 4.0;
- **Cyber 4.0** (Rome) focuses on cybersecurity;
- **MediTech** (Naples) focuses on Advanced Transportation Systems, biotech, construction, energy and ICT sectors.
Figure 17: Map of the 8 Competence Centers in Italy

8 Competence Centers in Italy

Elaboration from Politecnico di Milano, MADE presentation [2019].

Competence centers provide companies with orientation and advanced training services. Moreover, they promote the collaboration, share and exchange of competences and knowledge among enterprises, universities and research institutes.

The following paragraphs will deepen the services offered by the competence centers focused on the manufacturing sector (MADE and CIM 4.0) and on the Advanced Robotics technology (ARTES 4.0).

MADE
MADE is the competence center based in Milan and founded by Politecnico di Milano in collaboration with Università degli Studi di Brescia, Università degli Studi di Bergamo, Università degli Studi di Pavia and 39 companies, including IT vendors, consulting, training and manufacturing firms.

The focus of MADE on manufacturing sector is due to the fact that Lombardy is the Italian region with the highest concentration of manufacturing companies (around one fifth of the total) and Politecnico di Milano is a technical university that has always had tight relationships with the business environment.

As stated by the Prime Minister Giuseppe Conte during the opening of the 157th academic year of Politecnico di Milano in October 2019, “as confirmation of the specific aptitude of this Politecnico to effectively interact with the industrial world, the government through its Ministry of the Economic Development established 10.5 million euros for the Competence Center MADE, promoted by this Politecnico, which is an international excellence center for the manufacturing sector, [and which is] able to offer companies those services needed to allow them to face the digitization of production processes”.

Beyond the resources allocated by the government, MADE received 3.2 million euros of funding from private partners, which committed themselves to investing around 13 million of FTE (full time equivalent) in three years for the development of this project. Indeed, MADE requires a high commitment of resources and time in order to accomplish its mission of “informing and showing Industry 4.0 technologies, explaining them through ad-hoc training activities, in order to transfer and implement the technological solutions through projects”.
In detail, MADE will provide to companies three main services:

- **company orientation** towards industry 4.0 technologies through seminars, company visits, workshops, and specific “use cases” applied to 14 technological cells located in MADE factory 4.0 demo-center.
- **practical training**: Blue collar workers and middle management will be trained in the demo-center to use and exploit 4.0 technologies through the 14 technological cells. As highlighted by Marco Taisch during the presentation of MADE call on 13th December 2019, “investments in training means ensuring the future of the company”.
- **technology transfer** through innovative industrial R&D projects. Conversely to IT vendors, MADE strength is to leverage on many different competences owned by 39 companies and four universities. In this way, MADE is able to satisfy a wide range of needs and develop a variety of projects.

According to the assessed digital maturity level, MADE will provide to companies different supporting services:

1) **Industry 4.0 strategy**: in accordance with corporate objectives, companies with low digital maturity level will be supported in the design of a strategic plan and a roadmap to introduce new digital technologies and strategic skills.
2) **Projects**: MADE will assist companies in the design of innovative industrial R&D projects and new organizational models.
3) **Demo and test**: MADE partners and companies will develop demos, prototypes, proof of concept and test-bed solutions that will be tested in MADE Smart Factory, which is a safe environment where employees can freely verify their ideas without fear of making mistakes.
4) **Technological scouting**: MADE will help companies in scouting the most suitable technology and IT vendor among its partners basing on their digital needs.
5) **Technology consulting service**: MADE will support companies in the implementation of new technological, managerial and organizational solutions aimed at improving processes from an Industry 4.0 point of view.
6) **Industry 4.0 project validation**: MADE will validate the adequacy of technologies, methodologies and their implementation with respect to the objectives set and the state of the art.

During MADE conference on 13th December 2019, some partners explained the reasons why they decided to join this competence center.

According to the Italian firearms manufacturing company Beretta, MADE is a great opportunity to be part of a stimulating environment, where it is possible to exchange ideas, join innovative projects and improve digital competences and know-how. Moreover, partners can create a structured benchmarking in terms of digital maturity level.

The multinational ICT company IBM declared to pursue the same objective as MADE to incentivize the Italian companies towards digitization. Moreover, MADE enables IBM to reach new clients, especially among small enterprises, and to join a knowledge-sharing network composed by highly accredited universities and innovative companies.

Despite the presence of competitors, Siemens Italia decided to be a partner of MADE because it represents an opportunity to increase visibility and serve new clients. Indeed, it is better to cooperate with competitors to enlarge the client market instead of fighting with them in a small one.

Moreover, MADE smart factory demo-center allows Siemens employees to freely test and validate new product and process solutions.
CIM 4.0
Competence Industry Manufacturing 4.0 [CIM 4.0] is the competence center based in Turin and managed by Politecnico di Torino and Università degli Studi di Torino along with 23 private industrial partners.

CIM 4.0 aims at being a reference point as regards skills and best practices for manufacturing companies willing to digitally transform their industrial processes from an Industry 4.0 perspective. CIM 4.0 will install four pilot lines in order to support companies in the development of new innovative products and advanced production processes in specific technological areas, such as additive manufacturing, Industrial IoT, Smart Grid and Artificial Intelligence, and in industrial fields typical of the territory on Piedmont, which are the automotive, energy and aerospace industries. Moreover, CIM 4.0 will promote the spreading of training and culture 4.0 through “Enterprise 4.0 Academy”, which will provide highly qualified education to companies’ employees.

ARTES 4.0
Advanced Robotics and enabling digital Technologies & Systems [ARTES 4.0] is the competence center managed by Scuola Superiore Sant’Anna of Pisa along with other 12 universities and research centers in collaboration with 146 companies.

ARTES 4.0 differs from the other competence centers because it is constituted by a network of 13 hubs spread all around Italy through which it offers companies different services, including technology transfer and training activities. Each hub is located in a university partner and it provides knowledge and expertise in a specific technological field: Industrial Internet of Things, Simulation, Augmented Reality, Advanced Manufacturing Solutions, Additive Manufacturing, Horizontal/Vertical Integration, Cloud, Big Data Analytics, Cyber-Security.

ARTES 4.0 kept supporting and encouraging Italian companies to invest in innovation also during coronavirus outbreak, whose crisis was costly both in humanitarian and economic terms. The competence center decided to launch an extra call to finance industrial research and experimental development projects that exploit industry 4.0 enabling technologies to face and contain the short and long-term social and economic effects of COVID-19 on all both public and industrial sectors.

Focus: Innovation hubs
Innovation hubs aim at supporting companies in their digital transformation process with different services, customized according to the digital and technological maturity level, the sector and the size of the enterprise.

These hubs are usually the first access point for companies approaching to industry 4.0 paradigm, as their offices are located in the industrial associations, which are well distributed in all the Italian territory. As Confindustria represents the interests and the needs of Italian manufacturing companies, only the services and activities of its Digital Innovation Hubs (DIH) will be deepened.

Digital Innovation Hub of Confindustria
Each of the 21 Digital Innovation Hubs set by Confindustria collaborates with local industrial associations in order to provide companies with the most suitable services according to the industrial competences characterizing the region it is serving.

In order to level competences and increase coordination among Digital Innovation Hubs, Confindustria set up a Digital Executive Team, whose aim is to align activities, develop common innovation projects and exchange best practices between them.
Figure 18: Map of the Digital Innovation Hubs set up by Confindustria

Digital Innovation Hubs (DIHs) deliver highly qualified services to companies, including:

- **digital awareness and education** on opportunities linked to the industry 4.0 technologies applications through seminars, workshops and visits;
- **digital maturity assessment**, definition of the roadmap for the digital transformation of business processes and support in the development of 4.0 projects. A specific standardized tool, designed by Politecnico di Milano and Assoconsult, assesses companies’ technology adoption from 1 to 5, which are the lowest and the highest score, respectively. The use of this standard rating tool allows to understand the general level of industry 4.0 maturity and awareness in Italy. In 2019, DIH Lombardy carried out 255 digital maturity assessments, whose average score resulted to be equal to 3.1, meaning that Italian companies are still at the halfway in their digitization process.
- **orientation towards innovation ecosystem**, which is composed by universities, competence centers, technological clusters, lighthouse plants, industrial labs, research centers, science parks, startup incubators, investors and local entities. Gianluigi Viscardi, president of DIH Lombardy, stated that they wanted to be a “general practitioner for entrepreneurs”: as the general practitioner assesses a first diagnosis and sends patients to the right specialist, DIH assesses the digital maturity level of companies and orient them towards the most suitable institution according to their needs.

Moreover, Confindustria and the Italian association of managers Federmanager launched AMa-DIH project (Affiancamento Manageriale per DIH – managerial support for DIH), whose objective is to increase the managerial and technical competences of small and medium companies though the temporarily hiring of a real manager. They will support companies in carrying out digital maturity self-assessments, in drafting a roadmap and in identifying the best financing resources and incentives to start their digitization process.

### 6.2 Technology Cluster Smart Factory

In 2012, before Industry 4.0 National Plan, the Italian Ministry of Education, University and Research (MIUR) established the creation of eight Technology Clusters, public-private partnerships whose purpose is to promote industrial research, technology transfer and education on a specific technology field at national level. Technology Cluster Smart Factory (Cluster Fabbrica Intelligente) aims at strengthening the Italian industrial competitiveness and modernization and better ensuring the sustainable growth of the manufacturing sector. Its mission is to define, develop and implement a national strategy based on research and innovation, able to lead the Italian manufacturing system towards new products, services, processes and technologies.
In order to favor close relationships between industry, research and national and regional public institutions, the Technology Cluster Smart Factory created a community composed by large companies, 140 SMEs, universities, research centers and industry associations.

The collaboration among these cluster members led to the development of seven research projects called Technical-Scientific Thematic Groups (GTTS), whose role is to analyze the current state of art of the industrial sector, monitor current projects and existing infrastructure, define paths of technology development by specifying research priorities and the level of technological maturity.

The Technology Cluster Smart Factory selected some companies’ members [ABB, Tenova - Ori Martin, Hitachi Rail SpA, Ansaldo Energia] for the design and construction of four Lighthouse Plants, which are production factories either build from scratch or restructured in order to be entirely based on industry 4.0 technologies. They are called lighthouse because they will become a national and international benchmark for all the companies willing to pursue digital transformation and industry 4.0 paradigm. Furthermore, they will constantly evolve in the years in order to always improve their processes and solutions.

All four Lighthouse Plants completed the construction phase and they are actually involved in the development of specific projects concerning the practical application of industry 4.0 technologies enabling the growth of the manufacturing sector. This research and innovation phase is in collaboration with various actors, suppliers, integrators, institutions and research center.

The main projects and objectives of the four lighthouse plants are summarized below:

- The Lighthouse Plant of ABB, multinational company leader in the automation systems, is composed by three factories located in Dalmine (Bergamo), Frosinone e Santa Palomba (Rome). The different size of the three plants allows any company, included SMEs, to find solutions that are suitable for their needs and can be easily replicated. Each ABB plant applies all the industry 4.0 enabling technology in order to achieve a digital supply chain integration with its clients and suppliers.
- The Italian steel producer Ori Martin and Tenova, worldwide supplier of products, services and technologies for the metals and mining industries, developed together the Steel 4.0 Lighthouse Plant located in Brescia. It is a steel cyber physical factory based on a hybrid cloud system, able to connect all the machines and collect data thanks to advanced sensors and machine learning systems. This system enables a better traceability, safety and integration of production processes.
- The transport engineering company Hitachi Rail SpA felt the need to renovate the design, quality and production processes of its three factories located in Naples, Pistoia and Reggio Calabria. The aim is to develop new innovative transport solutions, a PLM (Product Lifecycle Management) system, a renewed IT infrastructure and new industrial collaborative robots to improve work ergonomics and safety. To date, 150 suppliers, 70% of which are SMEs, have been directly involved in the supply chain integration.
- The gas turbine manufacturer Ansaldo Energia is actually focusing on the implementation of MES (Manufacturing Execution System) and MOM (Manufacturing Operations Management) systems on its two plants located in Genoa. Other objective to be achieved correspond to the application of industry 4.0 enabling technologies, including predictive maintenance, smart safety, smart training and cyber security. In order to increase digital supply chain integration, Ansaldo Energia launched AENet 4.0 project, whose aim was to select 100 Italian strategic suppliers in order to align them with the main initiatives of its digital transformation roadmap.
Beyond the Lighthouse Plants, Italy hosts two of the 16 “lighthouse manufacturers”, which are world’s most advanced sites implementing technologies of the Fourth Industrial Revolution, selected from a survey of over 1,000 manufacturing sites conducted in 2019 by World Economic Forum (WEF) in collaboration with McKinsey. As mentioned in the report Fourth Industrial Revolution: Beacons of Technology and Innovation in Manufacturing, the two Italian production plants are owned by the pharmaceutical company Bayer and, surprisingly, by a small enterprise Rold Srl, which produces components for domestic appliances, especially for washing-machine original equipment manufacturers (OEMs).

As declared in the report, Rold Srl was included in the “Manufacturing Lighthouses” because “it has applied digital manufacturing technology at scale to increase productivity and quality in the context of a small organization. It demonstrates that Fourth Industrial Revolution innovation is possible even with limited investment by using off-the-shelf technology and collaborating with technology providers and universities.” Indeed, the company was able to increase its efficiency by introducing a digital platform that allows a constant control of the process and which is continuously improved by workers that proactively develop new functionalities. Rold Srl always puts its employees at the center of its factory and, for this reason, it has launched change management and communication initiatives aimed at transforming the organizational mindset, engaging and training employees in technical and soft skills.

Beyond the internal improvements, Rold Srl’s digital transformation led to the creation of smart, interconnected products, which allow its customers, washing machine OEMs, to improve the digital integration of their supply chain and to offer new services to the final consumers.

The report summarizes the vision of the company, which uses technology not as an end goal, but as a mean to increase efficiency of the production processes, work safety and to acquire, satisfy and retain customers: “Rold envisions a factory in which digital solutions and automation provide the best possible support for operators to maximize production output while increasing worker satisfaction and empowerment.”

Focus: Lombardy Cluster Smart Factory Association (AFIL)
Lombardy Cluster Smart Factory Association, from now on AFIL, is an no-profit organization, which groups more than 130 members among enterprises, universities, public research centers, and industrial associations located in Lombardy. AFIL is a supporter member of the National Cluster Smart Factory, but it was founded by the Lombardy Regional Government to define strategies and to foster industrial research and innovation development projects in the Advanced Manufacturing field, thus supporting the growth, the leadership and the competitiveness of the Lombardy production system.
AFIL incentivizes the cooperation among companies and universities to develop regional thematic working group projects (e.g. de- and remanufacturing, digital & intelligent factory, additive manufacturing, materials and surface treatment), and to join European initiatives. Indeed, AFIL is a member of the Vanguard Initiative, association formed by the most advanced manufacturing regions in Europe. In particular, AFIL coordinates the “Efficient and Sustainable Manufacturing” program called Vanguard ESM, whose objective is to develop a European network of pilot plants focused on the key topics of manufacturing efficiency and sustainability (e.g. circular economy, energy and resource efficiency, smart and adaptive assembly).

At the regional level, AFIL aims at enhancing local companies’ awareness on the existing opportunities provided by Industry 4.0 and at sharing best practices. For example, one of the current AFIL projects is Cento 4.0, which identifies and rewards every year those Italian companies that developed innovative digital solutions by exploiting Industry 4.0 enabling technologies.

A company awarded by Cento 4.0 is G2 of Ghioldi Srl, a small Italian company that designs and develops switchboards and other systems for the industrial automation sector. It received the label of innovative company after developing IOTLY, an open Cloud platform which collects, analyzes, elaborates and transforms data into meaningful information for the management and the remote control of production systems.

The trigger of this innovative solution was the request of a Japanese customer to monitor production parameters of Ghioldi Srl directly from its factory located in the Philippines.

In order to accomplish client needs, G2 involved in the project many resources, including several professionals and experts. After a long and complex development process, the company created IOTLY, which enables real-time production monitoring, optimization of energy and material consumption, check on the status of machines and systems, planning of maintenance interventions in a predictive way, and notifications alerts in the presence of alarms. In a nutshell, by analyzing and processing data, it is possible to significantly increase the efficiency of the production systems and, in general, of the whole company, thus creating value.
7. BUSINESS OPPORTUNITIES FOR AUSTRIAN COMPANIES
Strengths and weaknesses, opportunities and risks of the sectors (SWOT analysis)

**Strengths:**
- Italy is one of the largest economies in the world. In 2019, Italy was the second largest manufacturing hub and third largest economy in Europe. Ranks fifth in the world for trade surplus.
- Geographical proximity to Austria
- The Italian economy is driven by highly-qualified and specialized goods produced by family-owned SMEs
- Italian workforce is worldwide recognized for its highly-skilled and specialized technical competences, managerial skills and its adaptability to change
- Transition 4.0 plan is incentivizing demand for digital technologies and assets
- Regional governments, industrial associations and universities are fostering enterprises towards digitization
- Lombardy as knowledge hub and driving force of Italy and Europe
- Trade associations and a well-structured industry 4.0 network

**Weaknesses:**
- Stagnation of the economy
- Unstable regulatory framework
- Inefficient and slow justice system
- Complex bureaucracy and inefficient public sector
- Complex fiscal system
- High corporate tax
- High labour costs
- High energy costs

**Opportunities:**
- Good reputation of Austrian products and services – high quality
- Demand for high-tech machineries with low environmental impact
- Demand for new digital technologies, especially among SMEs
- Demand for sustainable solutions
- Need to increase the security of corporate systems in a cybersecurity perspective
- Need for training, learning and education on digital technologies, especially among SMEs
- Government incentives [e.g. Transition 4.0 plan and Green New Deal]
- Regional incentives fostering foreign companies to open production facilities in the territory

**Threats:**
- Uncertainties in the political policy
- Budget deficit / high government debt
- Slow economic development
- Long payment terms and risk of unpaid invoices
- Brain drain
- Infrastructure shortage

**Business opportunities for Austrian companies**
Industry 4.0 and the digital transformation process is advancing in Italy, but at different rates, depending on the sector and on the size of the companies. In particular, small and medium enterprises are facing challenges in the wake of this digital transition. For this reason, different national government Industry 4.0 plans (i.e. Industry
4.0, Enterprise 4.0 and Transition 4.0] and other policies (e.g. Green New Deal) have stimulated the demand for new high-tech machineries, plants and equipment with a low environmental impact. According to “the factory of the future” of the trade association Assolombarda, 49% of the manufacturing companies in Lombardy, which is one of the most advanced manufacturing systems in Europe, own machines that are less than 10 years old, meaning that the majority of enterprises still need to upgrade their production systems. This represents an interesting business opportunity for manufacturers and entrepreneurs from the Austrian machinery and equipment industry, whose products are recognized for their high level of quality in Italy. It is no coincidence that Austria is among the top 20 machine tools importers countries in Italy. In particular, according to the machine tools data related to January-November 2019 published by ISTAT, Austrian metal forming machine tools are very appreciated by the Italian market, as Austria was the second importer of metal forming machine tools after Germany.

According to International Federation of Robotics, the Italian industry association UCIMU and robotics experts, the demand for industrial robots is expected to grow in Italy in the next years. This country represents a great business opportunity for Austrian companies providing integrated robotics solutions, in particular those addressed to the metal and machinery sector, as this was the largest customer of industrial robots in Italy in 2018.

Austrian manufacturers should leverage their high quality reputation and communicate it to potential clients and partners, mainly located in in the regions of Northern Italy, in particular Lombardy, Piedmont, Emilia Romagna, Trentino Alto Adige and Veneto. Beyond being close to Austria, these regions are called “pentagon of the economic development” as they drive the Italian economic system. According to the Nord-East Foundation report 2019, they are characterized by a high income per capita and employment rate, which are the main drivers of the high standards of living, economic development, advanced services and technological innovation, meaning that companies located in these regions are more likely to invest in the industrial upgrading of their production processes.

According to 2019 report of the structure and competitiveness of multinational companies published by ISTAT, the key drivers that positively influence the decisions of foreign multinational companies to invest in Italy are the knowledge, the specialized technical competences, the managerial skills and the adaptability to change of the Italian work force. Nevertheless, one of the most compelling needs of the Italian manufacturing system is to combine investments in technological solutions with strong training and education in new digital technologies. For this reason, the Italian government set up tax credits for expenses concerning employee training on digital matters. Therefore, it is suggested to Austrian companies to provide Italian small and medium enterprises with innovative products and relative training services to educate client’s employees to fully exploit the benefits of advanced technologies.

Innovation and technological development is progressing at the same pace as the need of protecting against cyber-attacks. As confirmed by the research studies conducted by Politecnico di Milano on the industry 4.0 market, cybersecurity is still niche market in Italy, but it has a high potential and represents an interesting opportunity for Austrian ICT companies. Indeed, it is expected an increase of investments in cybersecurity software solutions after the decoupling of incentives for investments in hardware and software established by the Italian government in 2020 Budget Law.

Finally, Italy boasts internationally recognized universities (e.g. Politecnico di Milano, Scuola Superiore Sant’Anna di Pisa, Politecnico di Torino), research centers (IIT - Italian Institute of Technology) and high-tech manufacturing companies that are open to develop an international network of relationships aimed at favoring open innovation and the share of ideas, knowledge, resources and skills.

In order to ease and encourage this innovation exchange between Austria and Italy, the Wirtschaftskammer Österreich – WKÖ - has recently signed strategic partnerships with IED [European Institute of Design] and with Politecnico di Milano, whose agreement details can be found within this chapter.
8. THE WAY TOWARDS CLIENTS
The choice and the design of the right marketing strategy is a prerequisite for any company wishing to perform a successful business in Italy. In general, companies with their own sales branch and their own sales representatives are performing better than those providing their products through an importer or directly send them from their home country. Indeed, establishing and developing long-lasting business relations with customers, suppliers and business partners is a key success factor in the Italian market. For this reason, hiring Italian-speaking people who understand the local practices and find the right contacts is highly recommended when entering the Italian market.

Important markets for the capital goods sector are located in the regions of Northern Italy, including Lombardy, Piedmont, Emilia Romagna, Trentino Alto Adige and Veneto.

However, before opening a branch in Italy, it is advisable to know about products and companies already serving the market.
The AußenwirtschaftsCenter Mailand supports Austrian companies with a wide range of services:

- Market researches and industry information
- Mediator with potential business partners
- Advice on legal and tax issues
- Support in setting up a branch
- Individual project support
- Networking and industry-specific events

The current services and event program regarding Italy are available HERE.

8.1 Possible distribution channels
Companies should select the right distribution channels depending on their objectives and constraints as well as the customer service level they want to guarantee. However, they should take into account also strengths and weaknesses of intermediaries, the distribution channel adopted by competitors and norms and laws.

Indirect distribution channels bring different advantages including lower costs and commercial risks, higher geographical spread of products, immediate market access and overcoming of the cultural aspect.

One of the most widespread indirect distribution channels in the industrial sector is still the involvement of sales representatives or industrial representative companies. The number and the choice of sales agents to hire depends on the width of the product portfolio, geographical coverage, competences and reputation required, and the level of dependency risk. It is usually difficult to cover the entire market with a single representative unless a big-sized agency with a well-developed distribution network is selected.

Sales agents enable companies to keep the market entry costs low and to benefit from their existing contacts and their consolidated experience in the Italian market.

The following sales channels could be selected:

- direct selling
- general importer
- wholesalers at regional level
- e-commerce, mail order
- branch

A representative office in Italy can be established depending on the type of product and / or service.

For further information see the report “Fachprofil Italien für Neuexporteure” as well as “Fachprofil Firmen- gründung & Steuern”.

Ein Service der AUSSENWIRTSCHAFT AUSTRIA
8.2 Tender databases for public contracts
After the publication of the EU directives 2004/17 / EG and 2004/18 / EG, all the Italian public procurement laws had been changed accordingly. 2001 constitutional reform (so-called federalization of the republic) established that regions are actually the main responsible for procurement laws, while the Italian state has competence only within the fields of safeguard of competition, ordinary jurisdiction, large cross-regional contracts and public authorities’ procurement procedures. Nevertheless, it is advisable to check whether any regional provisions include any peculiarities.

More information of the Italian public tenders can be found in CONSIP, INFO APPALTI and TELEMAT websites.

The AußenwirtschaftsCenter Mailand is available for further information on export in general, on tenders and rules for the award of public works, supplies and services contracts. Procurement law news and practical implications for your Italian business can be found in the report “Vergaberecht in Italien” published by the AußenwirtschaftsCenter Mailand.

8.3 Procurement procedures
The award of public contracts, including those for capital goods sector, are regulated in Italy in the Code of Public Procurement Law (Legislative Decree No. 50 of April 18, 2016).

The allocation and execution of public facilities must take into account the principles of cost-effectiveness, efficacy, impartiality, equal treatment, time limits, transparency and free competition.

As part of the award of a public contract, the tender notice must include the following information:

- requirements to be met for participants
- main characteristics of the services
- the way the contract partner is selected
- contract type
- exclusion

Furthermore, in the case of public contracts, a qualification certificate from special certification bodies is required. This certificate is intended to demonstrate that the company have necessary economic, financial, technical and organizational requirements needed to participate in the award procedure. This evidence can also be provided by the European Single Procurement Document (ESPD).

8.4 Company formation, taxes, recruitment
Detailed information on company law and tax law are included in the report Firmengründung und Steuern in Italien. Moreover, it provides suggestions on how to set-up a branch or company in Italy as well as a list of German-speaking lawyers and tax advisors. In addition, it includes interesting information on labor and social law, as well as on the procurement market for personnel and property.
9. SPECIAL EVENTS AND FAIRS, TECHNICAL PRESS

As the importance of relationship building is key in the Italian market, **trade shows and fairs** are good opportunities to find and meet potential customers, partners or competitors. Some relevant trade fairs for the capital goods industry are listed below in alphabetical order.

**A&T (Automation & Testing)** is the trade fair staged at the Oval Lingotto Fiere in Turin and dedicated to innovation, technologies and 4.0 skills. The fair is usually divided in four districts: design, production, reliability and logistics. Every year A&T Scientific Committee defines the themes of the fair, organizes conferences, round tables and events, and identifies the most successful application cases, awarded with the prestigious “innovation 4.0 award”.

**BI-MU** is the trade fair addressed to the industry of metal cutting and metal forming machine tools, robots and automation, additive and digital manufacturing and subcontracting. BI-MU aims at being a meeting point between production systems and digital world and, for this reason, it is composed by sector districts and “innovation areas”, dedicated to the industry 4.0 enabling technologies. Moreover, it organizes events on main technological themes not only in the exhibition days, but also throughout the year. It is staged at Fiera Milano.

**MECSPE** is the trade fair that offers a complete overview of production and industrial supply chain of the most important areas of the manufacturing industry, including machine and tools, automation and robotics sector. During the exhibition days at Parma Fairground, visitors can join round tables, workshops and other events in order to discover new trends, materials, innovative products and technologies for every sector. Specific events are organized for foreign delegations.

**SMAU** is the trade fair staged in Milan where to meet innovation and digital technologies providers, large tech companies, startups, incubators, associations, national and local institutions. Beyond the exhibitions days, SMAU organizes a roadshow in different Italian cities and European capital cities (e.g. London, Berlin and Paris). Here visitors can attend free workshops on the main digital trends and events where it is possible to learn about strategies and innovation projects carried out by Italian companies through the storytelling and sharing of case studies.

**SPS Italia** (Smart Production Solutions Italia) is the leading Italian trade fair for the industrial automation and digitalisation sectors, as it gathers every year in Parma tens of thousands of visitors and hundreds of exhibitors, including OEMs, end-users, distributors, system integrators, specialist press and universities. It is widely recognized as the key event for the Italian manufacturing sector. SPS Italia organizes conferences and events concerning additive manufacturing and other industry 4.0 enabling technologies in the exhibition days as well as throughout the year.

**Newspapers and periodicals** can be useful to know the latest news about the Italian manufacture sector and to find new contacts. Some magazines specialized in the manufacturing industry are listed below in alphabetical order.

**ÉUREKA!** is a periodical published in Italian and released every two months both in paper and in digital format. It is addressed to mechanics, automation, electronics, information technology sectors with a special focus on innovation and digital technologies.

**Italia 4.0: tecnologie per lo smart manufacturing** (Italy 4.0: smart manufacturing technologies) is a periodical focused on industry 4.0 enabling technologies applied to mechanics, automation, electronics, information technology sectors. It is published only in Italian and it is released every two months both in paper and in digital format.

**Il Sole 24Ore** is an Italian national daily business newspaper owned by Confindustria. Their target readers are managers, entrepreneurs and investors. It is released both in paper and digital format.

**Dall’UCIMU all’UCIMU** is the periodical released every two months in paper format for the companies’ members of the industry association UCIMU. It includes news and information on the association’s activities, the initiatives of the associated companies, market and sector trends. It is published only in Italian.
**Meccanica & Automazione** (Mechanics & Automation) is a monthly periodical distributed in paper and digital format for mechanics, machine tool and industrial automation sectors. It is published only in Italian.

**RMO - Rivista di Meccanica Oggi** is a periodical focusing on machine tools, automation and robots sectors. It is published only in Italian and it is released every two months both in paper and in digital format.

**Soluzioni di assemblaggio & meccatronica** (Assembly and mechatronics solutions) is a periodical distributed both in paper and in digital format and is addressed to the assembly and mechatronics industry. It is published both in Italian and in English.

**TECN’È** is a monthly periodical released in paper and in digital format. It focuses on mechanics, automation, electronics, information technology sectors and it is published only in Italian.

**WE ROBOTS** is a yearly periodical reporting trends, interviews and real cases concerning industrial robotics sector. It is published in Italian and it is released both in paper and in digital format.

AußenwirtschaftsCenter Mailand can satisfy requests of Austrian companies concerning contact details (e.g. contact names, e-mail address, telephone number etc.) and other information regarding trade fairs, newspaper and periodicals.
10. RESOURCES AND CONTACTS IN ITALY
Digitization offers important potential benefits to companies, including the offer of new smart services, a better supply chain integration, an improvement of work safety and ergonomics, an increase of production flexibility and energy efficiency of industrial processes. However, digitization is a complex process and, for this reason, enterprises require the support of research world in conducting R&D projects, technological transfer and training activities.

A selection of the most important Italian research institutions and universities that deal with the manufacturing industry are reported below in alphabetical order.

Fondazione Bruno Kessler (FBK) is one of the top research institutes in Italy in ICT subject and it has been certified as “technology transfer center” by the Italian Chamber of Commerce Unioncamere. Established in Trento, the Bruno Kessler Center in Information and Communication Technology [FBK- ICT Irst Center] is an internationally renowned center for conducting research on Artificial Intelligence, data science and cybersecurity.

IIT (Italian Institute of Technology) is one of the most important Italian research institutes, whose objective is to promote Italy’s technological development and higher education in science and technology. More specifically, IIT research focuses on technologies for life science [LifeTech], computational sciences, nanomaterials and robotics. Since 2009, this research institute has established 4 Central Research Laboratories in Genoa, including CRIS [Center for Robotics and Intelligent Systems]. Moreover, IIT has 11 research centres in Italy (in Turin, two in Milan, Trento, Rome, two in Pisa, Naples, Lecce, Ferrara and Venice) and 2 outstations located abroad (MIT and Harvard in the US).

Some researchers led to the creation of several start-ups in high-technology fields such as health tech, new materials, energy and robotics (e.g. qc-robotics).

Its robotics expertise is recognized also at the European level. For example, IIT is the most important research partner in the European project AnDy, whose aim is to improve the relationship between men and robots through the use of artificial intelligence.

STIIMA (National Research Council - CNR) is a research institute managed by CNR (National Research Council), which is a public organization aimed at conducting scientific and technological research. STIIMA mission is to address specific research on enabling technologies, processes and products in order to solve manufacturing problems within specific market applications.

STIIMA headquarter with RTD&I Laboratories and Pilot Factories are located in Milan. STIIMA Bari branch located in Via Lembo carries out research and development activities of new manufacturing equipment addressed to the mechatronic and aeronautical sectors, while STIIMA Bari branch in Via Amendola develops intelligent detecting and sensing advanced systems for diagnostics, autonomous navigation of mobile vehicles, surveillance and security. Lecco CNR hub focuses its researches on Smart and Human-Centered robotics, while STIIMA Biella addresses specific research and innovation activities on textile materials and processes, standardization and technology transfer to the textile sector.

According to the British THE Times Higher Education World University Rankings 2020, Scuola Superiore Sant’Anna di Pisa [Sant’Anna School of Advanced Studies] ranked first in Italy and 149th research-intensive university in the world. Moreover, in 2017, MIUR (the Italian Ministry of Universities and Research) nominated the Faculty of Experimental and Applied Sciences as “department of excellence”.

This university focuses its researches on robotics & artificial intelligence technologies in order to create a new generation of robots able to improve the health and well-being of people. Important results were achieved by the Biorobotics Institute, where two Italian scientists, Cecilia Laschi and Barbara Mazzolai (now moved to IIT), were pioneers in the development of soft robots.

According to 2020 QS World University Ranking, Politecnico di Torino [Polytechnic of Turin] is the 41th university in the world, in the category “Engineering & Technology”.

Its researches are focused on four macro-areas: Information Technologies; Management and Mathematics for Engineering; Civil and Environmental Engineering, Architecture and Industrial Design; Industrial Engineering. In particular, the university has strong competences and expertise in the automotive and electronics industry. One of the most important experts in the technologies and processing systems is prof. Dario Antonelli, which
developed a system that is able to teach robots how to weld two metal pieces simply by observing an operator that shows it the path to follow with a pin.

**Università Federico II Naples** is one of the most important universities in the South Italy. It manages the new competence center MediTech, which will focus its research activities on Advanced Transportation Systems, Biotech, Construction, Energy and ICT. The university hosts PRISMA Lab (Projects of Industrial and Service Robotics, Mechatronics and Automation), which is a robotics research center coordinated by prof. Bruno Siciliano, one of the most important robotics experts in the world.

### 10.1 Research institutions and universities in Lombardy

Lombardy is the Italian business heart and one of the most important European economic engines. In 2018, around 900,000 companies contributed to the Lombardy GDP, which resulted to be the fifth largest GDP among European regions ([Eurostat, 2019](#)) and which contributed more than a fifth to Italian GDP.

This exceptional outcome was due to the favorable geographical setting and the dynamic business system, which allowed Lombardy to become the first Italian region for both volume and value of commercial exchange with foreign markets.

#### Table 10: Comparison between Lombardy and Italy

<table>
<thead>
<tr>
<th></th>
<th>Lombardy</th>
<th>Italy</th>
<th>Lombardy/Italy (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in km²</td>
<td>23 864</td>
<td>302 073</td>
<td>7.9</td>
</tr>
<tr>
<td>Population (1/1/2020)</td>
<td>10 060 574</td>
<td>60 359 546</td>
<td>16.7</td>
</tr>
<tr>
<td>Workforce (thousand, 2019)</td>
<td>4 750</td>
<td>25 941</td>
<td>18.3</td>
</tr>
<tr>
<td>GDP (million euro, 2018)</td>
<td>390 331</td>
<td>1 765 421</td>
<td>22.1</td>
</tr>
<tr>
<td>Enterprises (12/2019)</td>
<td>954 672</td>
<td>6 091 971</td>
<td>15.7</td>
</tr>
</tbody>
</table>

Source: ISTAT and Banca d’Italia.

Lombardy is characterized by a solid and highly diversified economy, which integrates a manufacturing core with highly knowledge-intensive services [especially in Milan]. In particular, this region is internationally recognized for a strong specialization in knowledge-intensive sectors (life science, agribusiness, finance, industry 4.0, art, culture and design) and the availability of high skilled human capital. Moreover, a thick network of small and medium firms coexisting and interweaving with large enterprises and multinational companies. Indeed, 32.1% of the foreign multinational companies in Italy are located in Milan.

According to the [FDI European Cities and Regions of the Future 2020/2021](#) report, which classified 148 European regions based on their potential to attract greenfield investments, Lombardy ranked third after Cataluña and Comunidad de Madrid among the regions of Southern Europe (the only Italian in the top 10). In addition, it performed strongly in FDI Strategy category where it ranked fifth, proving the extraordinary results achieved thanks to a strategy based on building an ecosystem composed of innovative companies, startups and high-qualified universities.
Lombardy is the most important Italian innovation and knowledge hub as its role in relation to the National research, development and innovation effort is central. According to the statistics included in the Booklet Italy, Lombardy and Milan issued by the industry association Assolombarda, about 21% of the total Italian R&D expenditures are concentrated in the region. The private R&D expenditure of Lombardy is one of the highest in the Italian economy (79% against a national average of 63%) and it is mainly concentrated in health, energy and environment, advanced manufacturing, agri-food and ICT.

Moreover, as shown in the following figure, Lombardy is quickly catching up the gap with the best-performing European regions.

Figure 20: R&D activities in manufacturing firms 2015-2017 (% of firms)

![Figure 20: R&D activities in manufacturing firms 2015-2017 (% of firms)](image)

Elaboration from Assolombarda Economic Research Department, Booklet Italy, Lombardy and Milan, October 2019.

Lombardy is the most attractive place in Italy for startups (almost 3,000, 27% of the total), especially for high-growth knowledge-intensive startups (23% of the total). In 2019, more than 500 startups chose this region to start their business. Moreover, according to the 2019 Best Performance Award of Sda Bocconi, 197 out of 531 rewarded companies with the highest sustainable growth are established in Lombardy.

This innovative ecosystem is stimulated by high-quality public and private research centers. This region hosts 10 European certified science & technology clusters and 13 long-standing universities attracting 280,000 students, of which almost 14,500 are foreigners.

**Focus: Politecnico di Milano**

Politecnico di Milano (Polytechnic University of Milan) is one of the most outstanding technical universities in Europe, and the largest Italian university in Engineering, Architecture and Design, with nearly 45,000 students. Established in 1863, the university has two main campuses in Milan and other five ones located in nearby cities across Lombardy and Emilia Romagna.

According to 2020 QS World University Ranking, Politecnico di Milano is confirmed once again among the top 20 universities in the world in the “Engineering & Technology” category. Moreover, it achieved the seventh place in the Architecture category from the already excellent eleventh place of 2019, and the exceptional sixth place in Design, constant since 2019.

In Italy, Politecnico di Milano confirms its first place both in Engineering, Architecture and Design categories.
As declared by the Deputy Ferruccio Resta during the opening of the 157th academic year, Politecnico di Milano aims at being a European leading university, able to guide the scientific and technological innovation to improve health and well-being. Moreover, the university commits to supporting the manufacturing system in exploiting the possibilities offered by the energy transition, new production technologies, collaborative robotics and the circular economy.

In the same ceremony, the Italian Prime Minister Giuseppe Conte enhanced the excellent results, the high and diversified educational offer and the quality of teaching of Politecnico di Milano, which "has shown an uncommon ability to respond to the nowadays growing challenges, full of pitfalls but also of many opportunities that you have managed to seize." Giuseppe Conte also added: "The rapid and profound transformation of the production processes determined by the digital technological evolution has evidently found here a fertile ground of culture, in the professors and researchers, who are able to effectively identify with foresight the most profitable areas and ways to guide researches."

Politecnico di Milano is organized in 12 Departments and in 4 Schools, respectively devoted to research and education. Research plays a central role in the university mission and it is carried out in more than 250 well-equipped laboratories, divided into large infrastructures (e.g. wind tunnel), interdepartmental labs and departmental labs. For example, the Department of Electronics, Information and Bioengineering (DEIB), whose research is addressed to Information and Communication Technology (ICT), currently hosts more than 40 labs, including the new Leonardo Robotics labs, which group together Airlab, Merlin Lab (Mechatronics and Robotics Laboratory for Innovation) and Nearlab. In 2019, the three labs joined their diversified competences and experiences in the artificial intelligence, industrial and medical robotics fields to better exploit synergies and opportunities.

Moreover, the School of Management of Politecnico di Milano set up more than 30 Digital Innovation Observatories, whose aim is to broaden and deepen the practical knowledge about new digital technologies in order to share it with companies and public authorities.

One of the Digital Innovation Observatories is the Industry 4.0 Observatory, which is the Italian competence center for Industry 4.0 as its aim is to help managers and entrepreneurs to understand the opportunities of the Smart Technologies in the manufacturing sector. As stated by the director Prof. Sergio Terzi during an interview on 16th December 2019, 2020 objectives of Industry 4.0 Observatory focus on technological transfer activities, meaning supporting companies in finding practical applications of the Smart Technologies in the industrial environment. "We will continue to study how the new technologies will evolve. However, in this moment, we are more interested in understanding how and why they are used by the Italian companies," commented Sergio Terzi.
The Observatory has an Industry 4.0 Lab, where a fully automated and digitalized assembly line is installed. Its high flexibility and configuration modularity allows testing and creating a virtual copy of any type of manufacturing assembly system. Moreover, the system can be reconfigured very quickly through specific modeling and simulation tools. These characteristics allow using the assembly line both for research and training purposes.

Politecnico di Milano enables the exchange of experiences, knowledge, reciprocal contamination and entrepreneurial networking through its three centers of excellences: POLIHUB, POLI.design and Cefriel.

POLIHUB is the business incubator established in 2000 by Politecnico di Milano, thanks to contributions from important public and private entities. The mission is "to support highly innovative startups with scalable business models to foster cross-fertilization between the academy, the various startups and consolidated companies focused on innovation". According to 2019 UBI Global Ranking, POLIHUB is the world top 5-university business incubator worldwide.

POLI.design is one the most important design institutions in Italy and it is located in Milan, which is a universally known and recognized international center of excellence for design. This lively and dynamic climate can enrich the design training programs offered to young graduates, professionals and companies. POLI.design acts as an interface between universities, companies, and professional organizations and institutions.

Established in 1988 by Politecnico di Milano, Cefriel scarl is a center of excellence for innovation, research and training in Information & Communication Technology. Its activities consist in creating products, services and processes and spread culture in the digital innovation field. For this reason, it was recognized as one of the technology transfer centers certified by Unioncamere, which is the Italian Union of Chambers of Commerce, Industry, Crafts and Agriculture.

Cefriel is a consortium company totally autonomous from public or private funding and its shareholders are Lombardy universities, Lombardy Regional Government and 17 multinational companies.

Politecnico di Milano has tight relationships with the industrial world, as it has established many joint research centers, which are long-term strategic partnerships between the university and companies (e.g. ABB, Camozzi Group, Comau). These collaboration agreements aim at joining research and technological transfer activities. As highlighted by the Prime Minister Giuseppe Conte during the opening of the 157th academic year, Politecnico di Milano "develops a fertile relationship with the industrial world (maybe this is its secret) and, through the experimental research, the technological transfer."

Moreover, this university supports different institutions and associations (e.g. MADE competence center, Technology Cluster Smart Factory, AFIL – Lombardy Cluster Smart Factory Association, Digital Innovation Hub Lombardy) by proving them its technological and technical expertise.

A collaboration agreement between the Austrian Chamber of Commerce (WKÖ) and Politecnico di Milano (Polimi) was established in March 2019. These two institutions signed a Letter of Intent, where they declared to "undertake sustained efforts to further research and develop activities between Politecnico and Austrian companies, professional associations, institutions, research organizations and universities".

The aim of this strategic partnership is to "create awareness of business opportunities to enhance the international competitiveness of Austrian companies while taking advantage of the experience of Politecnico in collaborating with companies to generate creative innovations 'Made in Europe'".

The AußenwirtschaftsCenter Mailand, together with its offices in Padua, Rome and Bolzano, is encouraging and facilitating B2B cooperation between this university and Austrian companies through initiatives and events.

Future event of the AußenwirtschaftsCenter Mailand can be found HERE.

10.2 Science and technology parks
Science and technology parks are by definition crucial innovation actors whose competences are key for the economy of a country and especially for the current post-Covid recovery.

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Science parks focus on research, technological transfer and dissemination of knowledge to create and increase productivity, employment and international attractiveness of companies, know-how and investments. Moreover, their mission is to build fruitful relations, and favor the creation of effective synergies with national and international stakeholders belonging to research bodies, universities and companies. Indeed, the most innovative ideas emerge from continuous discussions, exchange and share of best practices.

APSTI [Italian Network of Science and Technology Parks] is the Italian association that represents 20 of the 45 science parks located all over Italy. Its mission is to enhance the heritage of scientific, technological and organizational competences inside its member parks, in order to share them with the entire innovation ecosystem.

Figure 22: Map of the 20 science and technology parks belonging to APSTI

As disclosed in a recent survey conducted by APSTI, the system of Italian science parks is unique in the international context: Italian science parks differ in size [i.e. the number of employees], range of services offered, the single-sector or cross-sector vocation, the solidity of collaborations with universities and research bodies, and the specific features of the territory in which the park is located.

Most of the Italian science parks are specialized in ICT, biotechnology, healthcare and services, including tourism, creative and cultural industries. Green technology, mechatronics, nanotechnologies and food are also relevant research areas.

The most important Italian science parks for the manufacturing sector are listed below in alphabetical order.

**AREA SCIENCE PARK** is a research organization located in Trieste that promotes innovation development and boosts synergies among companies, research centers, start-ups and the public administration. It hosts approximately 90 R&D centers, hi-tech companies, and more than 2,500 employees. Area Science Park has four main lines of business: **Science & Technology Park**, **Business Generation**, **Business Enhancement** and **Science & Technology platforms**. Moreover, the park coordinates the activities of the Digital Innovation Hub Friuli-Venezia Giulia, called Industry Platform 4 Friuli Venezia-Giulia (IP4FVG).

**ART-ER** is the consortium among the Emilia-Romagna Regional Government, universities, National Research Centers located in the region, the regional union of Chambers of Commerce. It promotes industrial research and technology transfer and it is in charge of managing and promoting Rete Alta Tecnologia [Emilia-Romagna High Technology Network], which is made of 90 industrial research labs and innovation centres and which provides skills, facilities and resources to the business sector. Rete Alta Tecnologia develops research projects in six clusters: **Agrifood**, **Build**, **Energy & Environment**, **ICT & Design**, **Mechanics & Materials** and **Life Sciences**. The Mechanics & Materials cluster focuses its activities on 7 strategic lines of research and innovation:
DaAMa (Digital and Advanced Manufacturing), A&RER (Automation & Robotics Emilia Romagna), MoVES (Motor and Vehicles), MAMM-ER (Advanced Materials for engine design and mechatronics), FLY.ER (Aerospace), NAUTICAL and FP (FluidPower).

BERGAMO SVILUPPO - POINT (Pole for Technological Innovation) of Dalmine is a branch of the Bergamo Chamber of Commerce and it provides different services to companies, including updating and professional training paths, orientation, innovation and technological transfer. Moreover, it provides high-tech startups with resources, equipped spaces, customized training and assistance services through its business incubator.

Città della Scienza is one of the most important technological center in South Italy. Established in Naples, it hosts a business innovation center, which fosters the sustainable growth of Naples, Campania region and South Italy.

COMONE xt Science and Technology Park is an innovation hub and startup incubator certified by the Ministry of Economic Development. It hosts 125 enterprises, of which one third are startups, and employs more than 650 knowledge workers. It has developed a network of 800 stakeholders, including companies, universities, research centers, banks and investment funds. ComoNExT is managing two innovative labs, called Fabbrica Diffusa and NExT Marketing Lab, where companies and startups can see, use and test industry 4.0 enabling technologies.

Galileo Visionary District is the Digital Innovation Hub of Padua, whose aim is to facilitate and promote research, technology transfer and innovation among companies. Moreover, it provides technical consulting services and training courses. It has also established a business incubator in order to finance high-tech startups. In July 2018, Galileo Visionary District has obtained the certification of technology transfer center by the Italian Chamber of Commerce Unioncamere. Its researches are focused on specific topics, including advanced manufacturing, additive manufacturing, augmented and virtual reality, simulation, Internet of Things, e-commerce systems, geolocation, RFID, barcode, tracking & tracing systems, system integrator applied to process automation.

Great Campus is the largest science and technology park in Italy. Established in Genoa, it fosters research and technological innovation and it hosts Human Technologies laboratories of the Italian Institute of Technology (IIT) and a technological incubator, which is open both to startups connected to the research conducted at IIT and to private business initiatives from external companies.

Kilometro Rosso Science Park is one of the leading private innovation hubs in Europe. It hosts 48 established companies, research centers, laboratories, high-tech manufacturing facilities and a campus of University of Bergamo. Its mission is to provide innovative services and to develop an international network of relationships not only among its partners, but also with the outside world, in order to favor open innovation and the share of ideas, knowledge, resources and skills. One of the partners of Kilometro Rosso is Intellimech, which is one of the most important private associations of mechatronics companies in Italy. Its member companies cooperate in order to do open innovation research and technology transfer activities in the mechatronics sector. The association aims at creating an “innovation chain” for its members, which can benefit from the exchange of know-how, ideas and strategy. Member companies of Intellimech are both SMEs and large multinational companies, including e.g. ABB, Brembo, Cosberg, Siemens and Schmersal.

NOI (Nature Of Innovation) Techpark is the technology park located in Bozen. It fosters networking between companies, universities and research centers to boost competitiveness, sustainable growth and technological transfer in five sectors: green, alpine, food, digital and automotive/automation sectors. It hosts 30 technological and experimental labs and offers consultancy services and support to enterprises and startups.

Technological Center of Navacchio is an integrated and structured innovation ecosystem, which focuses its researches on service, microelectronics, robotics, ICT, bio-medical, energy & environment topics. It collaborates with research systems, provides training courses, foster open innovation and stimulate networking between high-tech enterprises, companies, research and centers of excellence. Moreover, it has a startup incubator and

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business accelerator. Technological Center of Navacchio hosts Research Center “E. Piaggio” of Scuola Superiore Sant’Anna di Pisa, that aims at promoting and conducting research, development and training activities in Bioengineering, Robotics and Automation.

**Tecnopolo** is the Roman Science Park, which has two branches: Tecnopolo Tiburtino focuses its research on ICT, electronics and telecommunications, aerospace and green economy, while Tecnopolo of Castel Romano research fields are materials and advanced manufacturing, life sciences, environment and green economy.

**Trentino Sviluppo** is a company established by the Autonomous Province of Trento to foster the sustainable growth of Trentino economic system by delivering support services to enterprises. In particular, it represents the reference point for companies willing to operate in Trentino as it helps them to search for skilled workforce, get in touch with research institutions, engage with the public administration in order to get a permit or a license, get access to credit or apply for a grant. Trentino Sviluppo manages Polo Meccatronica, which is composed by a network of companies, startups, research centers and educational institutions belonging to mechanics and mechatronics sector. This is a very important sector for Trentino productive system, as it counts about 800 companies employing almost 10,000 people. Polo Meccatronica hosts Prom Facility, where innovative processes and products of the mechanics and mechatronics sector can be designed, developed, implemented and tested.

The AußenwirtschaftsCenter Mailand can support Austrian companies by providing them with the most suitable contact names and useful information concerning Italian science and technology parks.

### 10.3 Trade associations

Trade associations are very important institutions in Italy, as they provide sector trends, statistics and news. Moreover, they organize initiatives, fairs and events with a focus on the digital innovation technologies.

Some of the most important manufacturing industry associations are listed below.

**Confindustria** is the most important Italian trade association representing the interests of more than 150,000 companies of all sizes, employing more than 5 million people. The association provides information, trends and research studies as well as training and consultancy services to its associates. Moreover, it organizes also events, initiatives and projects for its member companies.

Confindustria collaborates with local, regional, national and European institutions in order to define the most suitable research, innovation and industrial policies enabling the increase of productivity and competitiveness of the Italian economic system. Moreover, it manages a network of local and sectoral associations, including ANIMA, Federmeccanica and Federmacchine, which are described below.

**ANIMA** is the association that represents and promotes the Italian mechanical engineering industry. It has over 1,000 member companies, whose revenues amounted to 48.7 billion euros and employing more than 221,000 people. ANIMA aims at providing companies with knowledge, skills and services and supporting them in resolving their technical and economic problems. Moreover, the association promotes its associates and their products in Italy and abroad and represents their interest to local, national and European public authorities. ANIMA is part of the Confindustria network and a founding partner of Orgalim (the European Federation of Mechanical Engineering).

**Federmeccanica** safeguards the interests of more than 16,000 Italian metalworking companies, employing a more than 800,000 people. The association offers to its associates sector research, trends and studies, consultancy and assistance services, technical education and professional training. Moreover, it promotes its associates to national and international institutions and stimulates its member companies in adopting industry 4.0 enabling technologies through seminars, events and fairs.

Federmeccanica is a member of CEEMET (Council of European Employers of The Metal Engineering and Technology-based industries), which is a non-profit lobbying organization based in Brussels, representing the interest of metal engineering & technology-based industry.

**Federmacchine** is the federation of capital goods manufacturers. This association supports its associates with sector research studies, trends and consultancy services. Moreover, it organizes different events and projects.
Federmacchine manages a network of 13 sectorial associations, including UCIMU-Sistemi per Produrre and UCIMA, which are described below.

**UCIMU-Sistemi per Produrre** is the Italian machine tools, robots, automation systems and ancillary products (e.g. tools, components, accessories) manufacturers’ association. It represents and safeguards the interests of more than 200 member companies, taking their requests to national, European, and Extra-European institutions. Moreover, the association aims at supporting its associates with specialist consultancy services. In order to increase the visibility of its member companies in traditional and emerging markets, UCIMU organizes events, projects, special initiatives and exhibitions, including BI-MU.

**UCIMA** is the Italian association that represents the interests of the packaging machinery manufacturers. Its main role is to foster the growth of the sector and to provide professional consultancy and assistance services to more than 100 member companies, which are mainly located in Emilia Romagna, Lombardy, Veneto and Piedmont. The association conducts research studies on the sectors and stimulates its associates in joining events, fairs and projects. UCIMA is also a member of the Italian Packaging Institute, COPAMA (World Confederation of Packaging Machine Associations) and EUROPAMA (European Confederation of Packaging Machine Associations).

Other small associations are described below.

**Ascomut** (Italian Association of Machines, Technologies and Tools) is the association representing small, medium and large firms importing and distributing machine tools, tooling, ancillary equipment and accessories, measuring machinery and instruments and chemical products for manufacturing and maintenance in Italy. Ascomut is a member of Concommercio, the largest business association that represents trade, tourism, transport and services sectors.

**AIdAM** (Italian Association of Mechatronic Automation) is the Italian association representing the mechatronic automation sector. In particular, the over 70 member companies (e.g. ABB, Cosberg and Schmersal) are specialized in the construction of special machinery, robotics, vision systems and intelligent components. AIdAM aims at supporting the growth of its associates in Italy and abroad. For this reason, it frequently organizes events, exhibitions and economic missions overseas.

**I-RIM** (Italian Institute of Robotics and Intelligence Machines) is an association of research centers and robotics companies (e.g. ABB, Comau, Universal Robots) that promotes the use of the robotics and intelligent machines technologies in order to improve working conditions and people well-being. I-RIM helps its member companies in promoting industrial application and the transformation of research into new products and/or new production processes. In addition, it supports its associates in conducting technical education and professional training in order to create highly qualified job opportunities. I-RIM collaborates with local, regional, national and European authorities in order to support the definition and implementation of research, innovation and technology development projects.
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