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**Final Thesis**


**Industry 4.0, competences, internationalization.**
Fre Tor case study

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*«...putting people first, empowering them and constantly*
*reminding ourselves that all of these new technologies*
*are first and foremost tools made by people for people»*

(Klaus Schwab)

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# I. Introduction

The aim of this work is to analyze the situation of Italian SMEs in terms of competences for Industry 4.0, actions to implement to solve issues, and the achievement of the ideal of "Factory of The Future", a "Smart Factory", highly technological and emotional.

After having analyzed the background of Industry 4.0 in small and medium enterprises in Italy and the possibilities to increase competitiveness, I focus the attention on the problem of lack of proper competences for Industry 4.0, both hard and soft, that constitute a hard step in companies development path, especially in Italy, whose entrepreneurial fabric is made by SMEs.

Companies are able to understand the potential of new technologies for their success, but they seem unable to find suitable workers.

They know they have the possibility to become a smart factory, but they fear the future and they are bound to their traditional processes.

To the first flaw, the "poor mindset", we need to add another one: Covid-19 pandemic.

The impact of Covid-19 is worsening the situation in economic terms, and most companies decided to disinvest.

However, the pandemic is revealing trends that are more and more digital and technological.

It is creating new jobs and new requested figures.

New technologies generate new business models and show companies their benefits, "gently" convincing them that the best decision is to invest, if they want to survive in the everyday more and more competitive environment.

SMEs should recognize the importance of these new figures, find the perfect "human-machine" balance and fight for their success.

However, it is more and more difficult to find operators, because of the rising complexity of the markets and the high instability of them.

An important example of a company that constantly fight to defend personal values and to grow internationally is Fre Tor.

Fre Tor can be defined as "Factory of The Future"

The company was inserted in Industry 4.0 panorama some time before the majority of SMEs did it, since it was born as extremely "4.0". This is a big difference from Fre Tor and other SMEs analyzed, but it is not relevant for the purpose.

In fact, Fre Tor found difficulties in hiring suitable workers like every other company, and faced up and down.

Fre Tor tried to solve its problems by going internationally, through the entrance in a multinational. However, every decision could not be successful per se; all organizational issues followed.

Nonetheless, Fre Tor had always clear in mind the objective and adjusted each piece for its achievement. With passion, dedication and precision, currently analyzes complexities and transforms them into simplicities.

Its perseverance should be taken as an example by all SMEs finding difficulties along the path.

## II. The impact of industry 4.0 on Italian SMEs

**Industry 4.0**

The term "Industry 4.0" was first utilized in 2011 by the German government ("Industrie 4.0") in the Hannover exhibition, when starting to pursue the objective of fostering competitiveness in manufacturing industry. Industrie 4.0 initiative was part of the "High-tech Strategy 2020", a plan for the promotion of industrial development of Germany. The plan puts the basis on the assumption of personalization of production on large scale, involvement of all stakeholders in production processes and integration of functions.

It describes, in fact, a set of technological tools that should be implemented in manufacturing. These tools are the fundamental elements to connect the physical and the digital world.

Speech by Federal Chancellor Angela Merkel to the OECD Conference, 2014:

*«In the European Union we must ensure that we retain or regain certain essential skills. I believe that what we are seeing at present is a comprehensive transformation of the whole sphere of industrial production through the merging of digital technology and the Internet with conventional industry. In Germany we call this "Industry 4.0". In Germany we have skills galore when it comes to car-making, mechanical engineering and the chemical industry. But we have few skills of our own when it comes to chip-making, Internet firms and software production, with the exception of SAP. The same goes for large parts of Europe. What we have to understand is that without the capacity for full integration through modern information and communication technologies, today's mechanical engineers will have no future. Working with devices which can communicate with one another is only possible with the right software skills and hardware capacities.»*

The German initiative soon spread across the World: *Industrial Internet of Things* in USA, *Society 5.0* in Japan, *Made in China 2025* in China, *Making Indonesia 4.0* in Indonesia, *Crafting the Future* in Mexico, *Industry4WRD* in Malaysia.

With the term "Industry 4.0" we commonly refer to the Fourth Industrial Revolution.

In this sense, it is necessary to briefly define the three revolutions and why the term has taken this acceptation.

*First Industrial Revolution (end of 18th century -> 1760-1840)*

First applications of knowledge to the field of industry produced an increase in production of raw materials and final products. Workers start to dedicate not only to agriculture, but also to industrial work and they migrate from rural communities to urban areas. Improvements in the medical sector make possible to decrease the mortality rate; we see a tremendous increase in population.

The role of the "Entrepreneur" starts to be of great importance.

In that period, efficiency comes also with the creation of "industrial districts": geographic areas in which some companies operating in the same sector are concentrated. These companies benefit from economies of agglomeration, since they can obtain craftmanship specialization and knowledge spillover.

The first revolution in manufacturing is given by the mechanization through water and steam power.

*Second Industrial Revolution (2nd half of 19th century -> 1850-1914)*

The main point in that period is the electrification of factories, with the application of telegraph and railroads into industries. These technologies permitted a significant reduction in transportation costs of raw materials.

In the medical sector, major improvements came out, especially with the x-ray application for internal diagnosis. Population continued to increase.

Inside the factories, however, rhythms of work were not so good for workers, that had to sustain long-working hours and bad safety conditions.

The second revolution in manufacturing is given by the application of the concept of mass production in assembly lines. In fact, the mass production of steel helped to introduce railways into the industrial system.


*Third Industrial Revolution (end of 20th century -> 1850-1970)*

The process of industrialization is seen almost all around the world.

There is the gradual substitution of manual work with intellectual one.

There is the emergence of multinational corporations, with plants settled in different countries. The main field of specialization is Research and Development, and intellectual inventions start to be patented and to constitute a true value-added for the company.

Digital technologies are applied in production: this Industrial Revolution is known also as "Digital Revolution". The fundamental elements are now computers and communication and information technologies.

The production is no more mass production but "Lean Production".


*Fourth Industrial Revolution (from 1970s on)*

The artisan starts to take attention to the new trends of digital manufacturing:


*«The design software does not only help the designer to develop and visualize the main aspects of the project, but also allows to go directly to its realization thanks to tools that cut, dig, and create on the bases of digitized instructions.»*

(Micelli, 2016)


As the artisans, other professional figures start to change: people have not only to learn new tasks, but also to learn how to use some new technological tools, known as "Enabling technologies".

Every part of the company starts to be digitalized and automized.

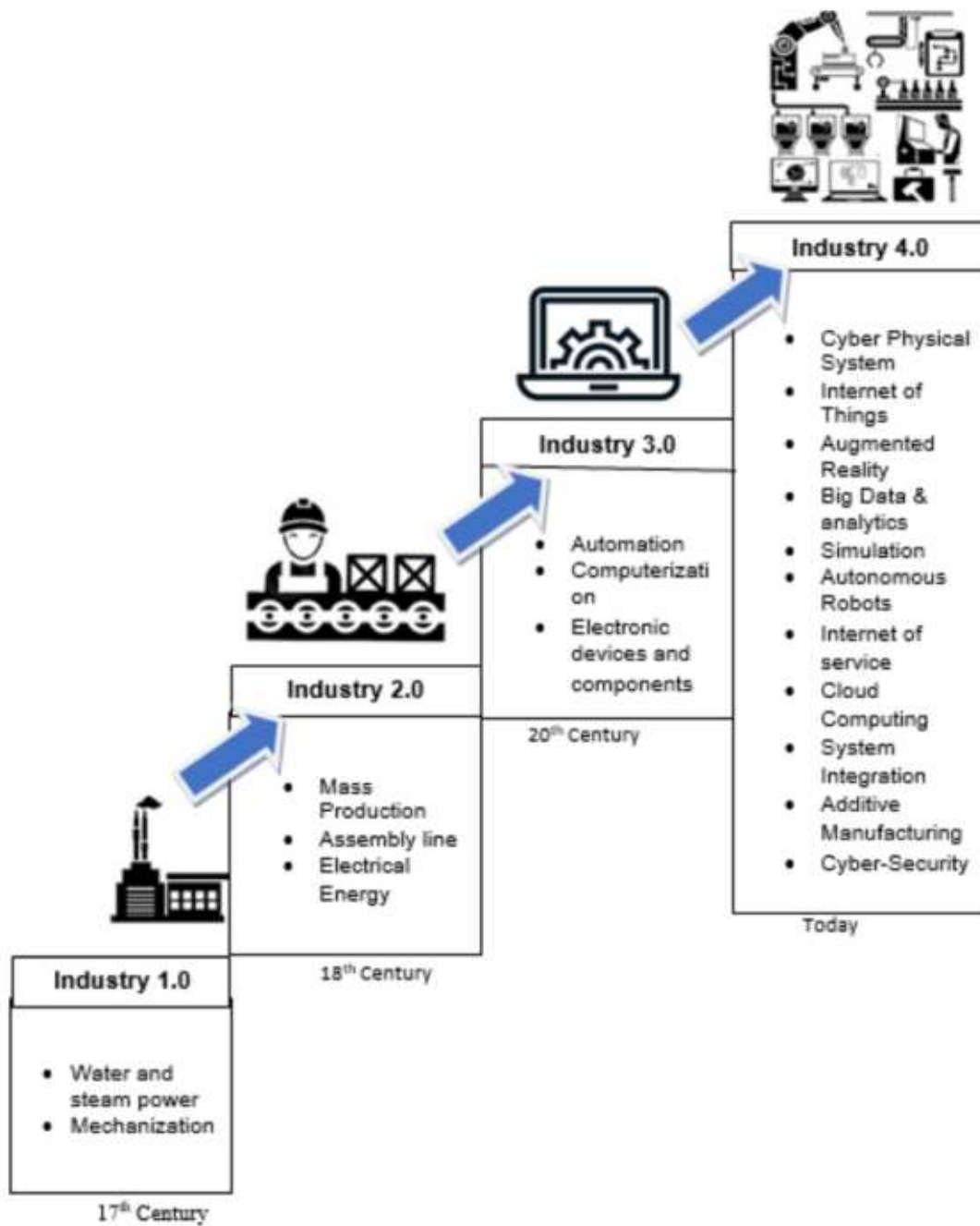Big international companies are able to implement the use of those technologies to increase their competitiveness, thanks to their high R&D standards and to their ability to attract talented workers. They can *«introduce self-optimization, self-cognition and self-customization into the industry. Manufacturers will be able to communicate with computers rather than operate them»* (Luenendonk, 2019).

**4th industrial revolution**
On the basis of cyber-physical production systems (CPPS), merging of real and virtual worlds

Industry 4.0

First programmable logic control system 1969

**3rd industrial revolution**
Through application of electronics and IT to further automate production

Industry 3.0

First assembly line 1870

**2nd industrial revolution**
Through introduction of mass production with the help of electrical energy

Industry 2.0

First mechanical weaving loom 1784

**1st industrial revolution**
Through introduction of mechanical production facilities with the help of water and steam power

Industry 1.0

Degree of complexity

End of 18th century   Beginning of 20th century   Beginning of 1970s of 20th century   Today
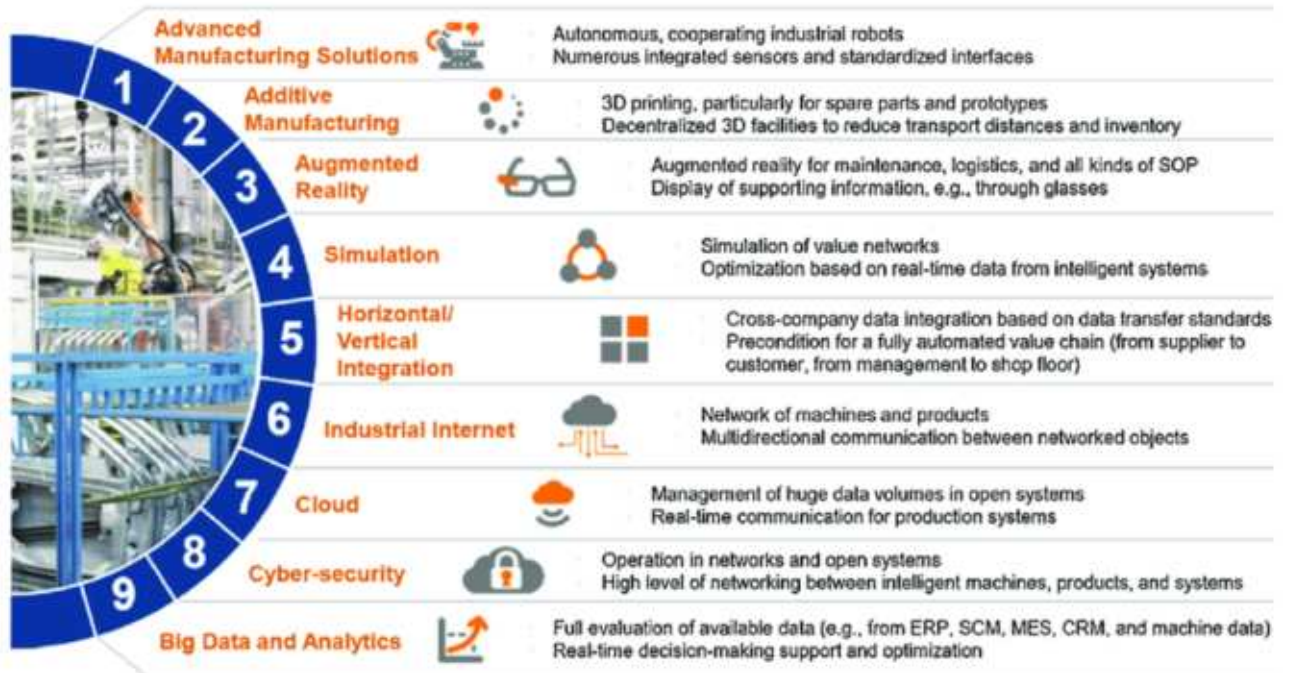
Source: Deloitte

Source: ResearchGate

The so-called "enabling technologies" are:

- Internet of Things: the network of physical devices that are connected with sensors and software to share data over the internet, analyze them and take action.
- Manufacturing Big Data or Analytics: tools to process large volumes of data manufacturing, supply chain management and maintenance, often coming from IoT systems.
- Cloud Manufacturing: application in manufacturing of cloud technologies with IT services to support production processes and supply-chain management and to analyze raw materials and costs of production.
- Robotics: it permits to perform standardized tasks through advanced automated systems, saving energy and increasing efficiency. However, advanced automation is not so useful and effective when companies want to personalize production on a large scale. According to the International Federation of Robotics, there are now 74 robot units per 10 000 employees globally in the manufacturing industries, compared to the average global density of 66 units of just two years ago. By regions, the average robot density in Europe is 99 units, in the Americas 84 and in Asia 63 units.
- Advanced HMI- "Human-Machine interface": tools to test some products and solutions and to visualize it in 3D through Augmented Reality. In fact, in this field we can find display touch and 3D scanner.
- Additive Manufacturing (3D printing): this tool permits the company to create a product starting from a virtual picture of it, by putting layers of materials in some geometric shapes. It can be applied in prototyping, manufacturing, maintenance, repair and modelling phases.

| | | Autonomous, cooperating industrial robots |
|---|---|---|
| 1 | Advanced Manufacturing Solutions | Numerous integrated sensors and standardized interfaces |
| 2 | Additive Manufacturing | 3D printing, particularly for spare parts and prototypes. Decentralized 3D facilities to reduce transport distances and inventory |
| 3 | Augmented Reality | Augmented reality for maintenance, logistics, and all kinds of SOP. Display of supporting information, e.g., through glasses |
| 4 | Simulation | Simulation of value networks. Optimization based on real-time data from intelligent systems |
| 5 | Horizontal/ Vertical Integration | Cross-company data integration based on data transfer standards. Precondition for a fully automated value chain (from supplier to customer, from management to shop floor) |
| 6 | Industrial Internet | Network of machines and products. Multidirectional communication between networked objects |
| 7 | Cloud | Management of huge data volumes in open systems. Real-time communication for production systems |
| 8 | Cyber-security | Operation in networks and open systems. High level of networking between intelligent machines, products, and systems |
| 9 | Big Data and Analytics | Full evaluation of available data (e.g., from ERP, SCM, MES, CRM, and machine data). Real-time decision-making support and optimization |

Source: ResearchGate

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The diffusion of Industry 4.0 tools creates some cross-industry implications:

- Personalization of output, local production and mass customization: technologies permit to produce at low marginal cost some highly customized products.
- Possibility for the customer not only to receive a 100% tailored product, but also to collaborate to the creation of it.
- Creation of customer-oriented services.
- Shift from trade of physical goods to trade of digital ones.
- The complexity of product and supply network will grow: some companies can adopt "mobile manufacturing units" to locally develop production adapting to local needs without establishing a new plant.
- Interdisciplinary thinking becomes essential: Industry 4.0 creates the need for both social and technical skills, with a shift from production thinking to design thinking.
- Lifelong learning and training of employees.
- Lightening of workload of operators.
- Greater safety of workers.
- Greater efficiency in communication inside the company, with positive implications in collaboration.
- Need for analysts, engineers, programmers, data specialists inside the company.
- Creation of new job titles.
- Greater attention to the environment, with positive consequences for the planet but also for company's image and reputation.
- Increase of companies' R&D.
- Collect real-time data and make real-time decisions.
- Reduction of trade costs.

*«Digitized products and services generate approximately €110 billions of additional revenues per year for the European Industry»*

(PwC)

Industry 4.0 is shaping the future of industries: some big, established firms will be able to change and adapt their structures to the new emerging trends, some companies will lack competences to do that, and they will disappear, some smart "late-comers" will exploit precious opportunities and capabilities and they will become the main competitors of the old big giants.

We said that for well established companies will be easier to adopt new technologies, because of their bigger amount of resources, both financial and human. Stakeholders will trust a company if it has demonstrated the ability to face challenges in years.

What if a company is smaller, or a new one?
A "late comer" can exploit some advantages.

The fact that frontiers between physical and digital world will be blurred causes lower entry barriers for smaller, more specialized companies. Suppliers concentrated in a small area will help the flow of knowledge inside and within companies.

**Italian SMEs**

The Digital Innovation Observatory of Milan studies Italian SMEs (small-medium enterprises), that have between 10 and 249 employees and a turnover lower than 43 million euros per year.
From the 2020 Research, it appears that even though these companies are only 5% of the entire Italian entrepreneurial network, they generate 41% of the total turnover, 38% of the total GDP and they employ 33% of the total workers in the private sector. However, the single worker value added is 28% lower than those of big companies and their salary 25% lower.

Hence, next to the big leaders, there are a lot of small and medium sized companies that in recent years have gained a lot of importance and competitiveness.

The source of competitiveness of the majority of Italian SMEs is their geography and relationship with the territory, in which they can create a "cluster" of knowledge and competence.

*Italian industrial districts*

Italy has a huge patrimony in terms of specialized areas of production, known as "Industrial districts", those which could be defined as the "predecessors" of mid-size firms. Giacomo Becattini is one of the most influential theorists of districts, that defined them as «*a socio-territorial entity which is characterized by the active presence of both a community of people and a population of firms in one naturally and historically bounded area. In the district, unlike in other environments, such as manufacturing towns, community and firms tend to merge.»* (1990)

The community has a homogeneous system of values and views, which is an expression of ethic of work and activity, family, reciprocity, change. Firms specialize in just one or a few phases of the production process.

The district is a "localized realization of a division of labor" (Becattini, 1990), which is not concentrated in one or a few firms nor diluted in general market.

The firms become rooted in the territory, so that the general process of production of a district has different features from another one in another district. Production processes must be spatially and temporally separable, so the fragmentation of production and flexible specialization permits firms to remain competitive with larger ones.

One of the fundamental aspects of districts, in fact, is the combination of competitive behavior of individuals with the semi-conscious and semi-voluntary

cooperation among them. The continuous exchange of competences creates benefits for the territory as a whole, not only for the firm.

In their evolution, districts were able to maintain a strong link with the territory, but also a huge potential for innovation. Districts permitted firms to benefit both from economies of scale of bigger ones and from specialization of smaller ones, located in the same area (Piore, Sabel, 1984).

*The Fourth Capitalism*
*«Districts are on the move»* (Piore, Sabel, 1984).

Districts followed an evolutionary process, starting from the 1990s, shaped by the globalization phenomenon and business opportunities provided by new technologies.
Districts developed by achieving the images of "single firms" that are "leading players".

With the traditional theory of district, the supply chain is "self-contained" within the district boundaries. External transactions occur with suppliers of raw materials and with the final markets. Spatial proximity permits the districts to reduce transaction costs of control, information sharing and coordination. Innovation is related to their industry specialization.
With the recent economic crisis, districts have started a process of internal reorganization, to leverage high quality internal competences in order to exploit international opportunities.
Districts achieved the image of "open networks" (Chiarvesio, Di Maria, Micelli, 2010): interfaces between local production systems and the global economy. Firms became able to invest in the "global dimension" by exploiting opportunities created by the discontinuity with prior trends in the district. They started to perform delocalization of subcontracting, selection of foreign specialized

suppliers and supply of qualified services outside the district. They upgraded global value chains, exploiting local competences in global networks.

In the environment of today, we can talk about a "Fourth Capitalism" (Mediobanca, 2011), considering Industrial Districts as the "Third Capitalism".
The fourth capitalism started in the 1990s. A large share of private companies was unable to exploit technologies to achieve the competitive advantage from the creation of innovative content rather than from lower-cost production. The manufacturing scenario started to be characterized by outsourcing.
The fourth capitalism is based on the presence of "systems" of firms that develop networks of relationships and exploit external economies. They survive until they remain efficient. The tendency of firms in the systems is of being medium-sized.

Those new firms are called "invisible champions".

*«They represent a type of enterprise that is not in an intermediate stage of growth, typically referring to management literature. They are often "invisible champions". They represent a mid-sized company profile that no longer grows linearly in terms of size increments, but begins to invest in interorganizational relationships.»*
(Serio, Barbaresco, 2017)

*Made in Italy*
Because of their size, structure, organization, SMEs have to face huge challenges when they try to remain competitive in the international arena. In fact, one consequence of the globalization process is that large firms and small and medium sized ones have to compete in the same arena.  The majority of SMEs is pushed to internationalization and competition with big corporation to be able to remain competitive.
One of the main drivers of internationalization of SMEs is technological research and innovation.

Italian companies have a great source of competition: Made in Italy certification. The Institute for the Protection of Italian Producers has created a certification system according to which producers distinguish their creations from those of dubious Italian origin. In this way it can be given, to the final consumer, certainty about the origin and quality of Italian products.

The 100% Made in Italy Certification is released following the law 166 article 16 of 20th November 2009, that state that the company should possess requirements such as 100% Italian production, Italian semifinished products, first choice raw materials, personal style of production, traditional craftmanship. The company obtains:

- Guarantee of the value and origin of the product
- Labels
- Traceability
- Anti-counterfeiting and brand protection
- Scouting of foreign suppliers
- Accreditation with important international distributors
- Advantages in calls for concessions

Consumers perceive higher quality of the products and higher safety when purchasing it, since they can distinguish 100% Italian productions from foreign products.

When we talk about Made in Italy, we typically refer to four sectors, the so-called "4A" in Italian (Abbigliamento, Automotive, Arredamento, Agroalimentare) or "4Fs" in English (Fashion, Factory automation, Furniture, Food). Each product, independently from the sector which it belongs to, is characterized by elements that determine the success and recognizability of Italian culture: creativity, quality, originality, excellence, tradition,

Made in Italy is a great source of competitiveness for Italian companies, when with competitiveness we indicate the ability to compete with success in global markets, in terms of products, services, business practices and exports.

Marco Fortis, head of Department of Economic Studies at Edison Spa, had identified "The Geography of New Made in Italy" (2008):

- 5 "Pillars": groups of companies with a turnover higher than 3 billion euros.
- "Pillars": big companies with more than 500 employees and a turnover between 290 million and 3 billion euros.
- "Columns": medium-sized companies with a number of employees between 50 and 499 and a turnover between 13 and 290 million euros

*«… the figure of Italy is quality, innovation that starts from traditions, territories and communities which, together with the care of human capital, culture and beauty, are an active part in the creation of value, including economic ones. In a word, the soft economy: "a sweet and immaterial economy, based on knowledge, on the enhancement of the identity of communities and territories and on respect for the environment", as the Treccani dictionary of neologisms defines it.»*

(Fortis, Realacci, Sangalli, 2019)

According to "I.T.A.L.I.A", a research conducted by Symbola, Unioncamere and Edison in July 2019, Italy is one of the first ten countries for R&D, and the most important element is not quantity, but quality of research: the average number of quotations in Made in Italy research have risen from 1,01 in 2000 to 1,35 in 2019, making Italy only secondo to the United Kingdom in the World.

Italy is at the second position in Europe for the number of innovative companies, 38361; the first one in Germany with 41793.

Going to one of the most important findings for this thesis, Robotics, the research found that Italy is at the sixth position in the World for number of installed robots (the most recent available data is the one of 2017, 64356). Also, in the field of robotics, Italy is important for culture and value: "Roboethics" is one of the trademarks of Made in Italy and characterizes products with innovation and sustainability.

Italy is then among the first countries for circular economy, sustainability, recycling.

Italy is among the first five countries for manufacturing, with 106,9 billion of surplus.

These data make us think about the importance of Italian SMEs: Italy has the highest number of manufacturing SMEs exporting in OECD area.

Italian SMEs are at the first position for export of textiles, clothes, leather and shoes, furniture.

It is true that without leaders, that produce high turnover every year, Italian economy will suffer a lot, but we can affirm the same if Italy remains without flexibility and specialization of SMEs.

These small firms are mainly family businesses; that start from an artisan and develop with the transfer of knowledge to younger generations.

## III. Consequences of Italian policy-making and Covid-19 pandemic: the NRRP and coordination of initiatives

In Italy, the diffusion of Industry 4.0 was characterized by different decisions and concrete implementations.

In 2016, the Ministry of Economic Development, Carlo Calenda, proposed a plan for Industry 4.0, highlighting *«Investments, productivity, innovation».* It would have provided companies investing in 4.0 with fiscal incentives of 13 billion. The main points were about the relaunch of productive investments, increase of investments in R&D of +11,3 billion, industrial research, ultra-wide band (*«The fiber to the factory is a crucial leverage of competitivity»),* "Super-Depreciation" (250% for 4.0 manufacturing goods), Digital Innovation Hub integrated with Competence Centers of Universities, to guide entrepreneurs in the change of business models.

However, real investments in formation were limited, and limited was the possibility to create dedicated infrastructures. There was the lack of coordination of Government, Institutions, Companies, Universities.

Even though news revealed *«The massive increase in automation and digitalization of processes are creating a revolution in the way of conceiving and proposing the product […] The client is no more consumer of goods, but of services. […] The market asks for products with a high personalization and with lots of content […] Industry 4.0 and Government incentives highlighted new points of contact between the two sectors.»* and investments in new tools developed, creation of centers of formation was poor.

As Potti (2020) states, *«Digital revolution should start first in entrepreneurs' minds and formation, with more diversified and higher skills, with human element at the center of Industry 4.0».*

In 2018, with the Ministry of Work and Economic Development Luigi Di Maio, some steps towards ultra-wide band were made. He decided some strategies for the implementation of blockchain, Artificial Intelligence, cyber-security, incentives for SMEs.

Implementation of Competence Centers and Digital Innovation Hubs requires to wait additional months again, but it signs the step towards real innovation: the shift from a plan focused only on fiscal incentives to a one focused on efficiency and flexibility.

*«Renewed the machinery, now is the time for people»*

(Potti, 2020)

In 2019 a new plan was proposed: *Transition 4.0*, with the Ministry of Economic Development Stefano Patuanelli, to *«Guide the productive World of our Nation towards a transition that will reward environmental sustainability».* The plan enlarged the tax credit for R&D.

Then, with the 2020 budget law new tax breaks were introduced, with new tools for easy finance (e.g. voucher for innovation managers, and incentives for R&D and formation).

## Covid-19 pandemic

Since February 2019 a new virus started to spread in Italy. It has been identified some months before in China, and called "Coronavirus".

The virus soon spread all over the world and became a pandemic.

The effects were tremendous since the beginning: hundreds of people were infected and died.

The government took the decision to force the Nation into a lockdown: all economic activities closed, and the effects spread also on the social, politics, economic side.

During this Covid-19 pandemic, Made in Italy products are preferred by Italians especially for supporting local economy, but also for needs of being more sure about the origin of products they purchase.

In the Coldiretti report of July 2020 is stated, in fact, that 82% of consumers want to purchase Made in Italy products, to support Italian economy.

Despite that, Italian SMEs are those who have suffered (and are suffering) the most from the pandemic, with a negative impact on the entire Italian economic system; to make an example, manufacturing and hospitality SMEs of high-impacted regions like Veneto, Lombardia, Emilia-Romagna, produce 10% of the Italian turnover.

Manufacturing SMEs are the source of productivity of other sectors, and they are fundamental for the majority of services: without manufacture, demand of services will fall (manufacturing companies asks, for example, for scientific and technical analysis and advice, financial services or logistic ones).

If Italy wants to recap huge losses, it needs to invest in SMEs, by permitting them to grow and increase productivity. To permit the growth, SMEs have to follow the objective of the digital transformation and innovation 4.0.

Just as the new Confindustria president, Carlo Bonomi, stated *«to relaunch Italian productive system, we need to invest in innovation and new productive processes».*

And who should drive this process of restart are SMEs. Italy, in this sense, cannot take Germany as an example: their "heart of national strategy" (Potti, 2020) are multinationals; Italian "heart" is made by SMEs, that have the great potential to create an *«Italian way to Industry 4.0»* (Bettiol, Di Maria, Capestro, 2018)

*The opportunity to accelerate the process of 4.0 adoption*

According to MISE (Ministry of Economic Development), only 24,4% of Italian SMEs has invested in 4.0 technologies and 10% expects to do it soon.

Covid-19 has, in some sense, accelerated the process of adoption of technology in general, with an opportunity for firms to adopt Industry 4.0 technologies. In fact, when government decided to close schools and all the other economic activities, maintaining only the functioning of essential ones, firms and educational institutions were forced to adopt remote working and teaching. Webinars, apps, delivery, e-mail, videocalls, permitted people to "survive" on the social sense, trying not to lose completely contacts with others.

*«In this new evolution, physical objects are perfectly integrated in the information network. Internet more and more combines itself with intelligent machines and processes to create a sophisticated network.»*
(Potti, 2020)

The "digital culture" of people, with the pandemic, has increased a lot.
This is the right moment for Italian SMEs to leverage the potential of technologies and "openness" of the mindset of people, to invest in Industry 4.0 and increase productivity, flexibility, efficiency, and competitiveness at a global level

Covid-19 has revealed imperfections of organizational structures of Italian firms and has accelerated a lot of trends that were emerging in the market before; only companies that will be able to adapt and be competitive, will survive.

**The NRRP**

Innovation was kind of hampered by poor infrastructures. For example, during the lockdown, the most lacking factors were access to fast connectivity, digital accessibility of school services and the sharing of data between healthcare facilities (Deloitte, 2020).

During this exceptional period, one factor that inevitably affected innovation was changes in consumption behavior. One example is change in mobility: a lot of people are not confident when using public transportation services, that call for new forms of mobility, green, smart cities.

*«If we know, in the new normal indelibly traced by Covid, how to include the human factor in each of these elements in the "formula of innovation", then the value generated will not only be what we need to develop in the post-Covid context, but it will also be sustainable and respectful of human needs. We must enhance the asset of excellence, human capital, encourage creativity and entrepreneurship, support technology transfer between research centers and companies in the ecosystem.»*

(Poggi, 2020)

In the Covid-19 context, the government tried to take some actions to help entrepreneurs in their fight for resilience. We can say, however, that the focus was on giving fiscal incentives or tax breaks. Coordination between different stakeholders is hard.

One example is the *NRRP* 2021, the *National Recovery and Resilience Plan*.

The plan is articulated in 16 Components, contained in 6 Missions:

1. Digitization, innovation, competitiveness, tourism
2. Green revolution and ecological transition
3. Infrastructures for sustainable mobility
4. Education and research
5. Cohesion and inclusion
6. Health.

The first one includes additional incentives for companies investing in 4.0 tools and the diffusion of 5G and ultra-wide band, trying to *«at least partially offset the uncertainty of the post-pandemic macroeconomic scenario, supporting companies that invest to innovate/digitize their production processes».*
The mission would create an increase of GDP of 0,8% in three years.

Of more relevance for the purpose of this work is the fourth: education and research. It starts with the recognition of critical issues of the actual education, formation and research system. It tries to strengthen all educational layers: from nursery schools to universities. Then, it focuses on the skills mismatch between education and labor demand: approximately 33% of Italian enterprises has the "recruitment" problem, and 31% of 24 years old students are in search of an occupation, but few of them want to attend technical schools. In addition, it focuses on the lack of researchers and the consequent loss of talents and opportunities for innovation.
For what concerns competences, the plan stresses the importance of STEM study courses (Science, Technology, Engineering, Mathematics) and of the digitization of schools, to make them become "connected learning environments".
It wants to create synergies between universities and enterprises for the research and introduce innovative doctoral degrees that should meet companies' requests and promote hiring of researchers.

Mission 5 involves labor policies, including those promoting employment of young people and acquisitions of new technical and transversal competences, in a work/formation/education matching perspective.

However, effective coordination between schools, universities, companies, hub, centers, laboratories, government is still poor.

**Infrastructures: how can policy shape the future of Italian industry?**

How can skills be obtained by workers? How can companies promote the formation of employees? Is maybe better to collaborate with other stakeholders or to go "solo" to focus on the real corporate needs? How can we increase soft skills without destroying hard skills?

In this chapter I will try to answer to this question, focusing on Italian SMEs, the core of my research.

*Pulse PMI Research*

To start, I would like to mention Banca IFIS, that during December 2020-January 2021 conducted a research: "Pulse PMI".

The aim of the research was to analyze organizational changes of a sample of Italian SMEs during the pandemic.

Besides smart working, SMEs have started (or increased) collaborations with universities. People are more and more at the core of the corporate value; they are seen as an important differentiating competitive factor, so they are properly valued. Researchers identified the three main elements of technological innovation: hardware that are unconstrained from physical workplace, remote collaborative platforms and cloud tools for information sharing and exchange.

From the research we can learn that half of the companies interviewed has built some collaborations with universities and technical schools, in the form of internship contracts, school-job experiences, training courses, plant visits. In addition, 1 out of 5 medium-sized companies has started a project of collaboration with Universities for R&D.

That is the right direction for SMEs: find, educate and maintain young talents to be prepared for the world of tomorrow.

Starting from these considerations, I would like to describe some Italian initiatives that have been carried out in order to increase and maintain workers skills for Industry 4.0.

**Infrastructures**

*«The collective nature of knowledge needs sharing strategies that become possible only if there is trust among economic agents and a context that encourage reciprocal relationships.»*
(Corò, Plechero, Volpe, 2020)

What types of projects could be implemented in order to promote these relationships and cooperation?

Some of the "platforms" that Italy has been invested in, are the result of implementations of legal decisions, some others are the result of private, strategic interest, others more are already existing infrastructures of which Italy should exploit the potential.

*Competence Centers*

They have been theorized by Carlo Calenda in the 2017 "Industry 4.0" Plan. They are in charge for conducting research and transfer knowledge to corporations, accelerating the digitization of processes, products and business models. Who manages Competence Centers has to lead a group of research centers, universities, big corporations, technological provides and SMEs. Competence Centers should be based on vertical specialization.

Some examples are:

- **CIM 4.0** (Turin): specialized on metallic additive manufacturing and digital factory, for aerospace and automotive sector.
- **Made** (Milan): it is based on its own technological providers inside the consortium membership (Ibm, Kilometro Rosso, Siemens, STMicroelectoronics, …).
- **Bi-Rex** (Bologna): it has not so many technology providers, but it contains a large number of users, mainly SMEs. It focuses on big data and additive manufacturing with research centers, in the fields of mechatronics,

packaging, Ict, services, automotive, aerospace, biomedical, agrifood, energy and environment.

- **Artes 4.0** (Pontedera): it focuses on robotics, in particular bio-robotics. It is the most diffused one: involves 7 Regions and 127 members (universities, research centers, corporations, SMEs and start-ups).

*Digital Innovation Hub*

They work in close contact with Competence Centers; they were theorized in the same Industry 4.0 Plan. The aim is to concretely help SMEs to understand and benefit from 4.0 transformation. Six DIH were created, in territories with large "industrial vocation" (Potti, 2020): Piemonte, Triveneto, Emilia Romagna, Lazio, Marche, Puglia. They have strong coordination at the national and European level (with a total of 39 DIH in Europe).

- **Cicero** (Lazio): specialized in Internet of Things and cyber-physical systems.
- **4M4.0** (Marche): specialized in Robotics and High-Performance Computing.
- **Smile** (Emilia Romagna): specialized in Lean Innovation, Physical Systems and Internet of Things.
- **Dima** (Piemonte): specialized in Advanced laser-based applications.
- **Apulia Manufacturing** (Puglia): specialized in cyber-physical systems and Internet of Things.
- **Triveneto** (Triveneto): specialized in Cloud-based HPC simulation.

*Technical Schools*

They are post-secondary schools, that form future workers in relation to the increasing demand of companies of high technical and technological skills to promote processes of innovation.

They are the basis to connect formation and education policies, work and industrial policies.

Their focus is on energy efficiency, sustainable mobility, biotechnologies, new technologies for Made in Italy, innovative technologies for culture, information and communication technologies.

They strongly rely on alternation between school and work; 30% of the entire duration of the course is performed inside a firm, in order to develop a strong link between the student and the productive world. They favor, in fact, the experiential study format: learning is based on actions and experimentation of tasks in uncertain but concrete and similar to work situations. Foreign internships are recommended, too.

Experience that students can develop in workplaces should not be mere execution or repetition of what they have learned at school, but an "intellectual challenge" in which students act following critical thinking and problem solving. Enterprises should become «experimentation gyms» that actively include young people (Finotto, 2015).


*STEM Study Courses*

They are a group of scientific-technological study courses (STEM, Science, Technology, Engineering and Mathematics). They are focused on innovation and prosperity of companies. A large number of companies collaborate with students of these study courses, in order to attract talents, diffuse digital competences and remain competitive (e.g. Siemens).

Some initiatives have been started to promote diffusion of them and gender equality, like "The STEM Factor" undertaken by Global Shapers Florence Hub, part of the World Economic Forum. It focuses on the inclusion of young people in economic and social changes of the World. It covers three thematic areas: environmental changes and sustainability, inclusion and equality, employment and education. In the first meeting (February, 2021) Paola Castellacci, managing director of VAR Group and CEO of Adiacent (part of SeSa Group), hypothesized the introduction of IT subjects at primary schools, to make students taking familiarity with them at the very early stages of their lives.

However, the transformation in this sense is proceeding slowly.

*Fab Lab*

Laboratories that offer digital manufacturing services to companies. They support organizations with the implementation of technological projects. They have born in the Usa, but they are quite diffused in all Italian territory.

*Soft Skills Lab*

The training process of soft skills requires the presence of multiple stakeholders. The project is carried out by Niuko – Innovation and Knowledge, a society of formation and firm consultancy of Confindustria Vicenza. It is a laboratory in which people can develop transversal (soft) skills. It was created after the recognition of the rising changeability of the markets. It is based on continuous analysis of corporate needs, in order to ensure value added in human capital. "Transversal" skills are leadership, problem solving, team building, time management; skills that are "transversal" to different disciplines and corporate fields.

The teaching methods are based on the experiential format: personal experiences are what permit to activate the learning process and people can learn at different rhythms and in different situations and styles.

It is based on four fundamental stages: experience, induction, concepts, deduction.

- Vision: support the betterment of performances of organizations, enabling the development of soft skills.
- Mission: "Your Potential, Our Passion".
- Values:
  - Firms are made by people; if people improve, firms improve
  - 80% of results is given by 20% of competences
  - Path, not courses ("Percorsi, non corsi")
  - Lab
  - Personalized projects, not packaged products
  - R&D was born from reality

The project has been applied to the creation of **Business Academy** and its evolution conducted to the creation of "**Soft Skills in Action**".

*Business Academy*

They are an opportunity of formation inside the company. Every big corporation has one business academy inside; on the other hand, most of SMEs lack one.

They have a strict bond with business strategy, client orientation and market changes. They operate thanks to digital technologies: the learning process is based on the use of them. People inside a business academy are at the same time the recipient of formation and active individuals in the development and sharing of competences. Innovation starts from people, for people. One business academy is a true and separated business unit, not a formation department; hence, it has an organizational structure, a "mixed" governance system, a mission and a vision, strategic objectives.

*GAV – Gruppo di Accreditamento e Valutazione (Padua University)*

It is a group of students, teachers and other stakeholders. The group has the aim of ensuring the continuity and updating the process of formation at universities and facilitating student's entry into the world of work. It is focused on updating characteristics that a future worker should have, according to companies requests and market trends.

*Soft Skills in Action*

Implemented by Niuko, Collegio Mazza, Padua University, Confindustria Padova, is *«Not a course about soft skills, but a learning experience to gain awareness and deepen, recognize and enhance one's knowledge and skills»* (Niuko, 2017).

The course is focused on learning soft skills, as the main skills that are able to give value to both technical abilities and personal ones, and to enhance personality in both social and work situations. It utilizes the experiential learning method.

*Philip Morris Institute for Manufacturing Competences (Bologna, 2020)*

It is a new initiative, to help develop competences through continuous formation of people.

The core of the initiative is to enhance individuals and stress the importance of innovation and digital transformation.

The learning process is based on the continuous usage of digital tools and on collaboration with universities, research centers, and other stakeholders.

*«Human intelligence, connected with artificial intelligence of machines, becomes the technical and creative gas of the production process»*

*«What permits robots to work are high technical competencies of employees: machines are at the service of human capital, and not vice versa»*
(Open magazine, 17 December 2020)

*Impact for Italy*

It is a strategic program of Deloitte Innovation Summit. It has the aim of increasing competitiveness of Italy, in order for it to express its full growth potential. In this sense, Deloitte could integrate synergy of public and private audience or create resilient growth strategies.

The project involves business communities, institutions, third sector, research centers and universities, but also citizens.

It supports firms in their digitalization process on the side of formation of *«competencies for the Fourth Industrial Revolution, favoring inclusion, diversity and promoting environmental, economic and social sustainability»* (Fabio Pompei, CEO of Deloitte Italia).

The program is based on people formation, as source of creativity and innovation.

**Are these projects working?**

Despite the recognized importance and effectiveness of the programs, the practical functioning is limited. Reasons can be found in the lack of a suitable Italian digital infrastructure and the problems of coordination between the variety of stakeholders. Instead of adopting an "open innovation" approach, often Italian manufacturers don't break business barriers.

It is at this point that Industry 4.0 needs to be considered first as a cultural transformation, then a technological one.

Unfortunately, in Italy there are only few ITS and STEM students, collaboration and communication among stakeholders is hard, investments in training are expensive and they imply a long-term corporate vision.

Workers needs dynamic capabilities and absorptive capabilities, that could be obtained through investments in training, with a careful analysis of potential value of each group of skills.

Companies find difficulties in taking decisions, since:

- It is difficult to state the quality of a program of formation and work opportunities in the future.
- Workers have more possibilities to find a different work.
- The acquisition of soft skills cannot be always certified with a written certification.
- The nature of training investments is intangible and uncertain.
- Profits are uncertain.

In addition, even when companies decide to invest in one project, they don't integrate it with another one, so losing the possibility to integrate hard and soft skills learning.

Covid-19 has accelerated the population decline which had already begun in the previous years. The most important reason is the uncertainty about the future and the instability of Italian government. As a result, there will be less and less young people that will give a contribute to the Italian entrepreneurial system. Unfortunately, actual policies are not able to support the defense of young occupation, since they only promote tax breaks and subsidies that, in the long period, will reveal to be more expensive than the promotion of new initiatives for young workers (Cagnoli, 2021).

## IV. Hardware and software: how lack of competence can shape the organizations. A global problem that will not easily disappear

**Results of an Italian research**

"Fattore I" is a research conducted, starting from 2019, by Banca IFIS, in collaboration with Ca' Foscari university (management department) and Padua university (economics and business sciences department). They made a quantitative analysis of financial statements of Italian SMEs at 31/12/2019, a web listening and a qualitative study.

The research aimed at learning "reality behind data" of SMEs, trying to understand what are the major challenges and opportunities for them, and what is the best strategy to capture and create value. Each of the companies interviewed has identified a "Fattore I" (literally the "I Factor") as a key factor for success.

The observatory was about nine productive sectors of Made in Italy: Automotive, Buildings, Transportation and Logistics, Mechanics, Food, Fashion, Technology, Chemistry and Pharmacology, Furniture.

*First phase of the research: before Covid-19 scenario*

The first methodology utilized was a quantitative analysis of financial statements. Researchers identified two "excellent" groups of SMEs: "Top" (4223) and "Stellar" (1040), that were able to distinguish themselves from "Average" SMEs in terms of ROE (2/3 times more) and investments (+11-17% per year against +3,4% of average ones).

This willingness to invest is seen as a competitive factor for firms: it emerges the characteristics of small Italian companies that are able to survive by leveraging the potential of new technologies.

60% of "Top" SMEs, before the pandemic, has already invested in 4.0 technologies to manage data and digital manufacturing. Only 44% of "Average" SMEs has invested in 4.0.

In this way, what emerges from the research, is that they were able to achieve flexible production and offer unique and distinctive products and compete in international markets.

Their focus was on differentiation strategy, not on cost strategy.

Little but important attention is given to the fact that with new technologies they could achieve the improvement in sustainability terms, too. "Top" SMEs were willing to use renewable resources, reduce waste of raw materials, energy, water.

Excellent SMEs had already a "solid" digital basis, since they have invested in websites, social media, ERP (Enterprise Resource Planning) systems, CRM (Customer Relationship Management), SCM (Supply Chain Management) and E-commerce. They increased then their digital "soul" by investing in Cloud Computing (54,2%), Integrating Systems (38,5%), Robotics (35,4%), then we have also Cyber security (28,1%), Big-Data (24%), IoT (18,8%), 3D Printing (14,6%), Artificial Intelligence (10,4%) and Augmented Reality (7,3%), with multiple adoption of different technologies for different production processes and goals.

Then, interviews among a sample of companies revealed that the major obstacle to adopt new technologies is the lack of skilled workers: 44,8% of companies interviewed, answered "Difficulty in finding adequate professional figures" to the question "What are the difficulties of adopting Industry 4.0 technologies?". The second aspect that emerged (33,3%) is the length of the processes of implementation of technologies, and also this could be related to the lack of skills of workers. Other difficulties are financial resources, identification of suppliers, lack of broadband, inadequate internal information systems.

Qualitative research also included a process of "Web Listening": the analysis of web conversation (Facebook, Twitter, Blog, News, Forum) through machine

learning to identify "Hot Topics" for companies and understand the trends that dominate the market.

Those trends are: Digital Transformation, Sustainability, Public Support, Human Resources and Competences.

As we can see, the adoption of digital tools and the problem of hiring the perfect workforce are two of the most important concerns.

Digital tools, in this phase of the research, are used not only to achieve efficiency, but also sustainability.

What did not emerge from the quantitative research is the firms' concern about finding suitable workforce. Their attention was on finding the perfect balance of man and machines in the organizational processes, to turn the current "threat" of the fourth industrial revolution into an "opportunity".

*Second phase of the research: after Covid-19 scenario*

From February to May 2020, the research focused on SMEs reaction to Covid-19 pandemic.

The methodology was mainly qualitative, because *«the emergency has constituted a breaking point compared to what could be represented in financial statements».*

Researchers used web listening and interviews on "Top" SMEs, to identify their immediate reaction, their technological dimension, the role of international markets and the effect on business models of consumption habits changes.

Now firms' performances are more related to the different industry sectors which they belong to, since the effects of the pandemic were worse in "traditional" Made in Italy sectors (Furniture, Fashion, Mechanics, Automotive, Buildings). On the other hand, Covid-19 turned to be an opportunity to grow for companies in Technology, Chemistry and Pharmacology, Logistics industry, for the big role they obtained during the pandemic.

More in general, the emergency has impacted on "trends" identified in the first phase of the research:

- Technology does not only mean "industrial innovation" but "survival". Companies started to adopt different tools to manage the problem of working from home and offering "digital" solutions to customers.

- Sustainability does not only mean "Eco-sustainability" for the evolution of production processes, but also "social" sustainability to support reconversion of production during the emergency and "environmental" sustainability for a better and more responsible use of natural resources.

- Public Support is not only needed for the growth of investments and protection of Made in Italy, but also to obtain cash for immediate recovery.

- Occupation sees not only the concern for competences and formation, but also for the loss of jobs, lack of workers after the closing of international supply chains, reorganization of workplace to meet new health standards.

All SMEs interviewed agreed that Covid-19 pandemic exaggerated the need for an organizational change.

Their focus was on giving great attention to clients, employees and suppliers.

*Third phase of the research: evolution of business models*

The third phase of the research was based on the use of a double methodology: quantitative and qualitative analysis, to understand first the impact of Covid-19 pandemic on financial statements, and then the evolution of business models.

61% of SMEs, at the end of 2020, saw a reduction of revenues (mainly belonging to Buildings, Mechanics, and Fashion industries, with an average of -26%), 9% an increase (mainly belonging to Food and Technology industries, with an average of +16%), and 30% revealed a stable trend.

*In which direction are business models going?*

SMEs can benefit from the adoption of technologies to create a personalized offer for clients and increase the provision of services to them. A trend that, in recent years but most of all with Covid-19 pandemic, has become to spread is "Servitization", the act of offering of not only products but also a large variety of services to clients: from after to post sale assistance, design, information, being closer to all activities along the value chain.

*«We have invested in solutions that would make it possible remote maintenance by means of augmented reality devices. So, using goggles, our operator remotely guides another operator located in various parts of the world in the maintenance of the machine.»*

(Alessandro Fenili, Matec Srl)

66% of SMEs has adopted new technologies (in January 2020 only 45% of them). The rate of adoption of technologies was high also in SMEs that saw a reduction of revenues (62%).

Sustainability achieved more importance: 70% of SMEs is worried by environmental impact; they want to minimize energy usage and wastes.

Among companies that were investing in R&D, 85% of them maintained a growing or stable trend; companies that saw a reduction of revenues achieved great results (77% of them maintained stable or saw an increase of R&D investments), too.

Their aim is to increase competitiveness, by searching for new markets, new products or both.

Almost all companies agreed that technology should be used as a method to increase competitiveness, efficiency, act and react to challenges of the market. A common understanding of SMEs is also that, unfortunately, it is very difficult to

find qualified workers, because of the complexity and the relative novelty of the phenomenon.

Despite Covid-19 pandemic, SMEs revealed to be resilient in terms of R&D investment, but it seems that they want to use this amount only to learn where and what to offer to the market, following the "traditional" trajectory of R&D.

However, by investing in research for human resources, companies could have the opportunity to hire skilled workers from foreign markets, or to learn how to teach employees new techniques, how to interact and use new technologies, how to balance their personal craftmanship with technological tools.

*The opportunity to increase competitiveness*

As demonstrated by the research, Covid-19 pandemic has provoked big consequences for SMEs structures.

The shock is seen by companies, industries and production processes in different ways and with different intensities, but also it creates trajectories of transformation of global supply and demand.

Existent equilibria between sectors are being disturbed, production chains are being modified, productive specializations are redesigned (Di Tommaso, 2020).

In a similar way of a "disruptive event", new technologies change the business model of a company. With a pandemic like Covid-19, companies are, in most of the cases, forced to change the business model in order to survive.

New technologies generate new business models and show companies their benefits, "gently" convincing them that the best decision is to invest, if they want to survive in the everyday more and more competitive environment.

*«Staying motionless in the race for innovation is the same thing of staying behind, in a market that is evolving at increasingly faster rhythms and in the most varied directions.»*

(Iannello, 2018)

In Europe, drivers of product innovation are environment, competitiveness and security, and they are interdependent. They could be obtained through digitalization and new technologies (Magone, Mazali, 2017).

The World Economic Forum (2020) predicts the changes in the workforce, inevitably affected by technological innovation, but also the impact of Covid-19. In fact, for example, 43,2% of companies interviewed said they will reduce the workforce because of technological integration or automation, 38,3% said they will modify the locations.



FIGURE 20 | Companies' expected changes to the workforce by 2025 (by share of companies surveyed)

Source
Future of Jobs Survey 2020, World Economic Forum.
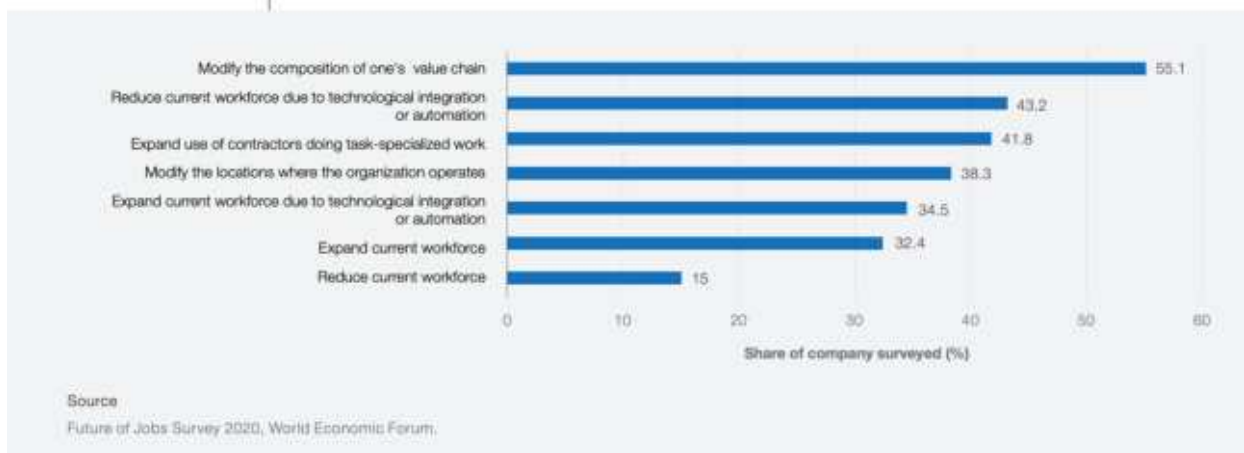
Onday (2018) gives us an analysis about benefits of Industry 4.0 among SMEs in terms of efficiency gains:

TAB. 1. *Effetti potenziali delle tecnologie I4.0*

| Tipologia di Costo | Range di riduzione potenziale (%) |
|---|---|
| Scorte | 30-40 |
| Manifattura | 10-20 |
| Logistica | 10-20 |
| Qualità | 10-20 |
| Manutenzione | 20-30 |

*Fonte*: Onday (2018).

In addition, gains of SMEs are also strategic: with Industry 4.0 technologies, they can adapt to the variety and variability of the markets and create new business models (Corò, Plechero, Volpe, 2020).

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Automation creates the need for reorganization of production chains, with gains in terms of speed of readaptation of productive lines after variation of demand, "mass" personalization of products (Thames and Schaefer, 2016).

*«However, unlike the recent past, companies can take advantage of an opportunity that could, at least, help them develop a coherent reaction path to strategic and operational challenges: digital transformation.»* (Secchi, 2018)
These words have been written before the advent of Covid-19, but they sound so current: they refer, the same, to changes in demand and consumption behavior that need an organizational change of companies.

Italian SMEs, especially those of Made in Italy sectors, have a big strength: the know-how, that is composed not so much by technical knowledge but by abilities, competences of creating the "beautiful and well made" (Confindustria, 2019) and offering unique products to clients. They should use this potential not only in the short-term, but in the long-term: they need to move away from the belief that they cannot give this know-how to anyone. They could give it to machines and let them use it efficiently inside the company.

*«The problem solving that emerge from manufacturing experience is very important to evolve towards the new technological frontier.»*
(Potti, 2020)

Integrating I4.0 technologies could imply different actions.
In order to help manufacturing companies in this process, CWS Digital Solutions, a consulting agency, identified a solution made of five steps:

1. Production: use of analytics to optimize processes. Based on the development of a new technological infrastructure that enable remote connection of machineries thanks to the IoT and permit to create a "digital twin" of the production plant, identify inefficiencies and react promptly.

2. Assistance and formation: prepare workers through augmented reality. It enables remote assistance, virtual and on-demand formation.

3. Sales: develop digital, "touch" catalogs. "Immaterial Reality" could permit to offer digital show rooms that permit to "feel the touch" of products.

4. Business: create new business models thanks to "smart connected products". It will permit companies to understand new market needs and diversify the business to be competitive. It will drive companies into "servitization", enabling companies to sell connected products "by use" (e.g. the business model could be a "pay per use" one).

5. Incentives: strategic definition of investments to benefit from fiscal incentives.

However, this further digitalization of SMEs, in order to permit them to truly react to the crisis and increase (or maintain) their competitiveness, should be "anthropocentric":

*«We need an innovation, but an innovation near the true needs of people, capable to create an interaction that balance digital and physical elements.»*
(Poggi, 2020)

What are those human elements?

*Competences*

They have been defined by Saenz, David, Munevar, Felipe (2020) as *«Expertise, aptitude, or suitability that one has to do something or intervene in a specific matter; ability to do something successfully or efficiently; ability to do something well, that is, with expertise».*

Competences are formed by skills, capacities, knowledge, attitudes and dexterities of each individual, and they depend largely on both exogenous (e.g. workplace) and endogenous (e.g. personality) factors.

*«One of the biggest concerns in technological, social and cultural advancement*

*in the workplace is the decrease in wages and the increasing unemployment*

*faced by people who are less prepared for the changes that are coming.»*

(Saenz, David, Munevar, Felipe, 2020)


Knowledge, skills, abilities, give greater importance to what is spread as competence. It all needs to be demonstrated with action.
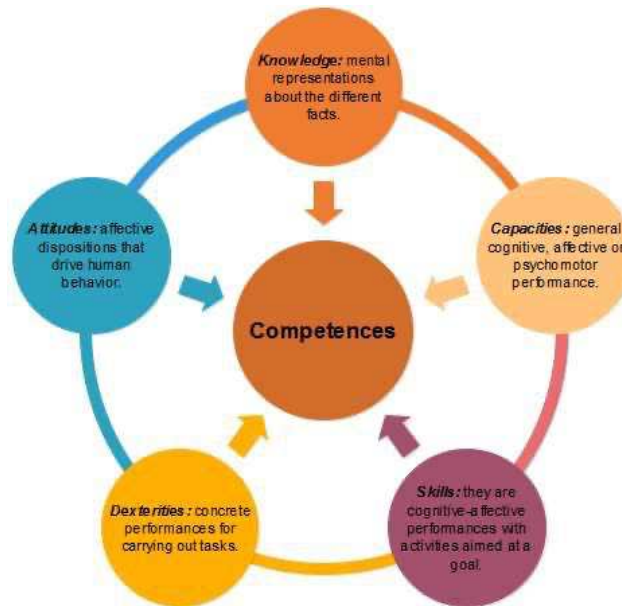


Source: Saenz, David, Munevar, Felipe, 2020


*Soft skills and hard skills*

Soft skills are how we do something, hard skills are what we do.

Soft skills are perceived to be the basis for the development of hard skills, technical competences to use I4.0 technologies.


They are the *«Set of knowledge and related personal abilities/capacities about how to consciously re-act to stimuli perceived in the situations experienced»* (Pezzoli, 2017).

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For companies of today, it is more important to produce at the right time and for the right customer rather than to increase production capacity.

This fact implies the necessity to change the teaching method: from frontal lessons to teach hard skills, tech competences, to «experiential» methodology, to teach behavioral competences, like how to solve new problems, bargain, plan the production.

The most important soft skill, according to the World Economic Forum (2016) is problem solving: taking decisions to achieve results.

Then there is critical thinking and creativity, to increase the possibility to overcome the status quo and common operative methods when they risk creating obstacles for innovation.

«Creators», those who know how to create value and design new ideas and solutions, will be one of the most required figures, as opposed to «executors», who perform routine activities (Niuko, 2017).

Soft skills are recognized to be fundamental by researchers all over the World.

To make an example, Cotet, Balgiu, Zaleschi (2017) talk about the main skills needed for Industry 4.0 by saying that soft skills can form a *«cluster of skills and personal capabilities»,* that is «*mandatory to select human resources from the perspective of Industry 4.0».*

Authors relate them with high performance, good interrelation and high professional self-development, creativity, emotional intelligence, proactive thinking.

Also for Grzybowska and Łupicka (2017) skills for I4.0 can be categorized in technical, managerial and social, for a total of eight.

- First category is related to knowledge that can be learned and practiced. An individual who possesses high coding skills suits for a computer company.

- Second category refers to skills and abilities for general problem solving and decision making, negotiation, response behavior.
- Third category includes social values and motivations, leadership skills, team working.

The eight skills are creativity (ability to perceive the world in new ways, make connections between different phenomena and find solutions), entrepreneurial thinking (identify marketplace opportunities and the perfect moment to capitalize on them), problem solving (comparing, evaluating, selecting), conflict solving (empathy, self-control), decision making (gathering information and assessing alternative resolutions), analytical skills (thought processes for evaluation), research skills (provide reliable information and advice, use resources in a changing environment), efficiency orientation (efficient use of resources for action).

**New requested figures**



FIGURE 23 | Emerging roles clustered into the jobs of tomorrow

Care Economy

**Cloud Computing**
1. Site Reliability Engineer
2. Platform Engineer
3. Cloud Engineer
3. DevOps Engineer
5. Cloud Consultant
6. DevOps Manager

**Content Production**
1. Social Media Assistant
2. Social Media Coordinator
3. Content Specialist
4. Content Producer
5. Content Writer
6. Creative Copywriter

**Data and AI**
1. Artificial Intelligence Specialist
2. Data Scientist
3. Data Engineer
4. Big Data Developer
5. Data Analyst
6. Analytics Specialist
7. Data Consultant
8. Insights Analyst
9. Business Intelligence Developer
10. Analytics Consultant

**Engineering**
1. Python Developer
2. Full Stack Engineer
2. Javascript Developer
4. Back End Developer
5. Frontend Engineer
5. Software Developer Dotnet
7. Development Specialist
8. Technology Analyst

Green Economy

**Marketing**
1. Growth Hacker
2. Growth Manager
3. Digital Marketing Specialist
4. Digital Specialist
5. Ecommerce Specialist
6. Commerce Manager
6. Head Of Digital
8. Digital Marketing Consultant
9. Digital Marketing Manager
10. Chief Marketing Officer

**People and Culture**
1. Information Technology Recruiter
2. Human Resources Partner
3. Talent Acquisition Specialist
4. Business Partner
5. Human Resources Business Partner

**Product Development**
1. Product Owner
2. Quality Assurance Tester
3. Agile Coach
4. Software Quality Assurance Engineer
5. Product Analyst
6. Quality Assurance Engineer
6. Scrum Master
8. Digital Product Manager
9. Delivery Lead

**Sales**
1. Customer Success Specialist
2. Sales Development Representative
3. Commercial Sales Representative
4. Business Development Representative
5. Customer Specialist
6. Partnerships Specialist
7. Chief Commercial Officer
8. Head Of Partnerships
9. Enterprise Account Executive
10. Business Development Specialist
11. Chief Strategy Officer
12. Head Of Business Development

(#) Rank    ● Niche    ● Mass

Source
LinkedIn Economic Graph.

This image represents LinkedIn data (thanks to the LinkedIn data science team) about new set of roles of each professional cluster. Researchers studied also the most representative skills associated with each profession (based on LinkedIn's Skills Genome Metric): employers interviewed will reskill or up-skill 62% of the workforce in the short-term, and by 2025 they will do it with a further 11%.

As we can learn from the list, the diffusion of Industry 4.0 technologies is creating a new and up-skilled variety of jobs professions.

An already mentioned economist, Gianni Potti (2020) focused on new Italian professional figures: soft-skilled super-technicians. Not only workers that have knowledge about new 4.0 tools, but workers that have "mental attitude towards change". Since new 4.0 factories should be flexible, also the "super-technician" should be. It has to be "responsive", ready to interpret new needs of modern production, propositive and proactive.

Workers of the future should be ready to adapt to market changes and continuously reinforce their skills background: *«in the traditional factory, employees' tasks changed every 20 years, today this span of time is reduced to at most 3-5 years»* (Potti, 2020).

Let's try to analyze some of the new figures:

- **Artificial Intelligence Specialist:** he is who manage AI platforms. He creates services like chatbot, routine activities automation, data set elaboration.
- **Data Scientist:** he analyzes data (Big Data) in order to extract useful information. Nowadays, more and more platforms utilize Big Data (e. g. social media, e-commerce, multimedia sharing platforms), so these professions are more and more required. he develops strategies and business models on the basis of data, that can be "human", "machines" or "business" generated. He interprets data through programming languages.

- **Social Media Coordinator:** he manages digital funnels of the firm. He coordinates other figures like **Web Content Creator** and **Visual Content Specialist.**
- **Content Specialist:** he is a "specialist of marketing of contents". He develops and implement web contents. He works next to the **Copywriter** and **Designer,** to produce a website in line with firm's standards. He has communication skills, since he needs to put himself in the shoes of clients: he creates value for the public and attracts the interest of readers.
- **Software Developer:** he develops computer programs. He can be specialized in the creation of the "**Back End**" (what is "behind" the software and permits it to work) or of the "**Front End**" (what is visible).
- **IT Recruiter:** he is a personnel recruiter; he researches and select the perfect IT profile for the company. He needs to know in depth technologies that the candidate will use.
- **Cloud Engineer:** he is the person in charge to verify and maintain the perfect functioning of the corporate cloud; infrastructures for elaboration, conservation and access to data need to be aligned. He needs to know a large variety of programming languages (Phyton, Java, …), operative systems (Linux, Unix, Windows, Mac, …), cloud platforms (Google Cloud Platform, Amazon Web Services, …), networking and security.
- **DevOps:** he is the figure that connect "developers" and "operators", to accelerate the release of the product. He creates system integration techniques, develops tools (control, integration, configuration management systems) and promote communication among divisions.
- **Analytics Specialist:** he collects and analyzes data, create marketing campaigns and optimizes them, and performs other actions for the functioning of strategies of corporate marketing.
- **Data Engineer:** he develops, maintain and evaluate the Big Data Solution (designed by the **Big Data Solution Architect**). He needs to understand what are the "planning needs" of the company and develop hardware and software to meet them.

**The problem of lack of competence in advanced economies**

The problem of lack of skilled workers is perceived in almost all advances economies.

Also foreign firms recognize the importance and the need of hiring able workers to best integrate with Industry 4.0 technologies.

I would like to quote some researchers.

*«Machines will be increasingly intelligent and powerful, but humans will actually be more essential»*

*«Critical thinking, creativity, communication and complex problem-solving to explore, innovate and rise to meet these exponential technologies.»*

(Hoe, Dargham, 2020)

*«...the golden era of globalization, the technology of the times was growing rapidly, in this position human labor would at times be marginalized if they did not have skilled skills.»*

*«Education is key to permit civilization process and the realization of the project "Making Indonesia 4.0".»*

(Ilmi, Darma, Azis, 2020)

*«Such advancement will radically remodel the labor market worldwide generating a paradigm change in defining the skill background needed to address these challenges.»*

(Cotet, Balgiu, Zaleschi, 2017)

*«Due to the novelty of the concept, however, there are many areas that are yet to be properly covered in the Industry 4.0 literature. One area on which numerous calls for additional research have been made is Industry 4.0 readiness, which refers to the assessment of a company's degree of readiness for a full-scale adoption of Industry 4.0 and its surrounding technologies.»*
(Rådinger, Samuelsson, 2020)

In Sweden, Rådinger and Samuelsson made a research to investigate the readiness of Swedish manufacturing sector.

The research was based on a qualitative analysis about eight I4.0 enabling technologies of a Swedish manufacturing company, trying to find evidence of a model developed by Pacchini et al. (2019), and finally assess organizational barriers and possible solutions for a company to increase its I4.0 readiness (where readiness is whether a company is ready to start the implementation of I4.0 technologies or not).

Pacchini et al. model consider Big Data, IoT, Cloud Computing, Cyber-Physical systems, Additive manufacturing, autonomous robots, Augmented Reality and Artificial Intelligence, as enabling technologies that need to be implemented in a company. For each of them there are six different additional prerequisites (e.g. presence of specific infrastructures, data organization).

The steps of the research are as follows:
- Scan the literature (using an existing framework).
- Sampling: investigating possible companies and choosing the best one for the research.
- Identify employees inside the company to be interviewed.
- Semi-structured interviews: they maintain the same basic structure by allows freedom to address some specific questions to some employees and freedom to formulate the answer.

- Hourglass sequence: from less articulated questions to more complex questions about technology and I4.0, to general questions to close the interview.

- Data evaluation: eight technologies, six prerequisites with four degrees of adoption, with a corresponding point. The readiness of the company for fully adopting a given technology is then calculated by dividing the total points of the six prerequisites by the maximum number of points available. Then, the overall degree of I4.0 readiness of the company is calculated by averaging the scores of all enabling technology.

- Evaluate the quality of the research: trustworthiness (credibility, transferability, dependability, confirmability) and authenticity.

- Define the company background, its specific features, opinions of interviewees about company's experiences with enabling technologies (including opinions for the most and least prominent technologies), organizational barriers.

- Find similarities/differences with other studies.

- Calculate an alternative degree of readiness, assigning different weights to different enabling technologies, according to the purpose and the relevance for the organization and adjust the data.

Authors identified some barriers to adoption: financial capacity, clear strategy and leadership, organization and culture (that need to support fast flow of information and encourage experimentation, create cross-functional teams, collaborate with suppliers and customers), *"Competency trap"* (to believe that a behavior that was successful in the past will be successful in the future. It is much more difficult to overcome for traditional, old, well-established companies. "Unlearning": real away from old models), Human resources or *"Lack of skilled enough workers"*: *«capabilities and skills required of the workers in an I4.0 context are different from those they normally have».* Companies need to find workers that not only know how to operate technologies, but also how to integrate them inside the organization.

Authors stressed the importance of collaboration with universities, culture and political context.

*Education 4.0*

*"Education 4.0"* is theorized by Caballero-Morales, Cordero-Guridi, Alvarez-Tamayo (2020).

It is considered as a possible evolution of the educational system. It is not a "Top-down" reform, but a "Bottom-up" one: without the action of businesses, the reform cannot be successful.

It is based on the combination of real and virtual world information through virtual learning environments and augmented reality.

The program categorizes competences into four groups: Technical, Methodological, Social and Personal.

It is based on establishing partnerships between businesses and higher education institutions.

*«The transformation of traditional production systems into smart factories, and the increased need for higher technological expertise from employees, requires the ability to deal with complexity, problem solving and overlapping process thinking and flexibility.»*
*(*Stachovà, Papula, Stacho, Kohnová, 2019)

Since the obsolescence of technological tools today is constantly increasing, the need for modernization of organization creates the need for constant formation of skilled engineering and technical students by universities.

The authors argue that Industry 4.0 tools should be used in the first stages of education at universities, in order to personalize programs, make future workers used to those technologies, and better prepare them for the work in an organization.

*«Mentoring between academy/industry and students/entrepreneurs must be*

*facilitated through I4.0 tools.»*

(Caballero-Morales, Cordero-Guridi, Alvarez-Tamayo, 2020)



*Figure 1* **E4.0 trends associated with I4.0 features**
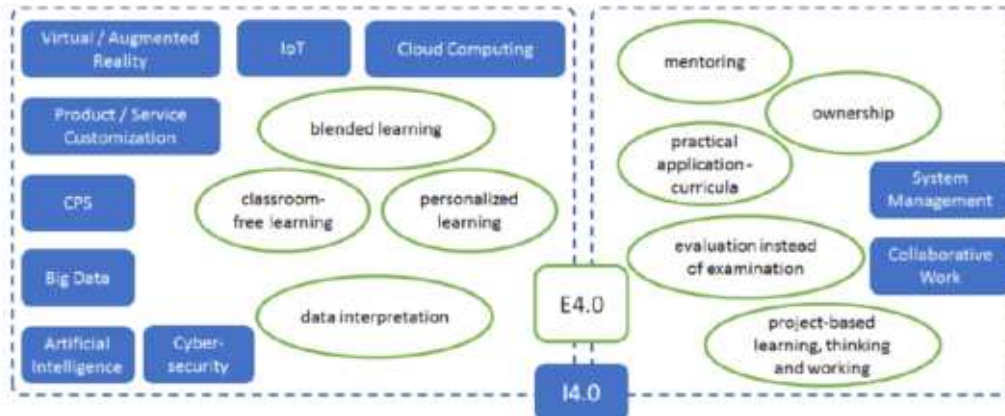
*(Source: own work extended and integrated from Mogos et al. (2018) and Das et al. (2020)).*

- Cloud Computing, IoT, Augmented reality and CPS to facilitate classroom free, blended and personalized learning, based on the necessities of the future worker.
- Big Data, helped by Cyber- security, to develop complex decision-making models.
- System management skills and Collaborative work are needed for the management and evaluation of the learning/ teaching process.

E4.0 should be based on personalized programs of formation of I4.0 tools; different engineering competences are different specialization fields, for which traditional college education is not enough.

*Society 5.0: The lesson of Japan*

The Japanese model is "human technology oriented" (Potti, 2020). In this view, SMEs are the key for medium/long-term society development: in Japan, like in Italy, SMEs are the reference productive fabric.

*«SMEs are the key to disseminate the fourth industrial Revolution in Japan. We will promote and support the introduction of IT and robots that are suitable for needs of small and medium-sized enterprises, according to business conditions of each industry.»*

(Shinzo Abe, Japan Prime Minister)

Society 5.0 is based on the creation of "connected industries", so on connecting objects, firms, organizations, people, data, not only to increase the turnover but also to increase the quality of work and create value. In this way, the new "society" becomes inclusive not only in terms of technological advancements, but also in terms of sustainability, social inclusion, quality of work and life, competitiveness. Digital tools permit the betterment of society.

One example of initiatives is *RRI – Robot Revolution Initiative* (2015), that is dedicated to the implementation of IoT and robotics and constituted by 500 members (firms, associations and practitioners). It is organized in three working groups, each of them with a specialization; the first one, the "action group", for example, takes robotic knowledge and use it inside small and medium-sized enterprises.

Society 5.0 includes many of these initiatives, each one characterized by different steps to raise awareness and concretely help SMEs with the introduction of I4.0 tools. The fundamental point is the connection between industrial and social actors. The connection works as a "platform" on three levels: connection of information, R&D and quality. All actors, in this way, are able to share data, findings and best practices.

Another example is a collection of 250 cases of "best practices" in a handbook.

**The comparison between Italy and other economies**

Even though the problem of competences is perceived globally, Italian infrastructural system creates additional inefficiencies.

Benefits of adopting Industry 4.0 technologies are recognized by almost the entire Italian entrepreneurial system, but many companies are reluctant to adopt those technological tools, especially during the first years after the diffusion.

According to a statistic made by the *Industry 4.0 Observatory* of Milan, 2018: only 2,5% of Italian enterprises don't know what Industry 4.0 is, but at the same time only 55% of them have started some projects of investments.

In addition, only 46% of companies interviewed by Polimi declared to be prepared to adopt technologies that will enable them to improve production processes.

Another research, made by **Deloitte (2018)** reveals that 32,2% of Italian manufacturing workforce is in high tech fields.

Italy has 5400 high-tech manufacturing enterprises and more than 105000 if we include services.

Investments in industrial machineries and digital technologies in Italy are growing. However, the adoption of new tools and the reduction of the gap with other economies (like Germany, UK, Poland) is slow.

Italian infrastructural system, because of all the problems related to the legislation, is kind of backward.

To make an example, in 2018 only 7% of Italian enterprises had internet connection with 100 Mbps speed, against a European average of 16% of enterprises (42% in Denmark, 39% in Sweden, 32% in Portugal, 25% in Spain, …).

As stated in the article, Italy has a "great potential": it is among the first positions in Europe for robotics, IoT, Cloud. This potential, however, in most of the cases remains unexpressed.

Why?

The gap is very large if we consider Italian vs Global investments in formation and education of workforce.

Italy is under European average in terms of digital competences of workforce (29% vs 37%), participation in training courses (8,3% vs 10,8%), number of students at technical schools (ITS, 9000 against 760000 of Germany, 529000 of France or 400000 of Spain).

The majority of Italian manufacturers recognizes the importance of implementing I4.0 technologies, but at the same time the imperfection of their business models to do it: only 6% of respondents answered "completely agree" to the question *"Do you have a solid business case that is able to support the implementation and development of technological solutions?"*.

At the global level, this answer received 8%.

What is really different between Italy and the rest of the World is the preparedness of manufacturers to the organizational change: to the question *"Are you aware of the way in which technologies will change the workforce and the organizational structure?"* only 5% of respondents completely agreed, against a 22% recorded on average in the rest of the World.
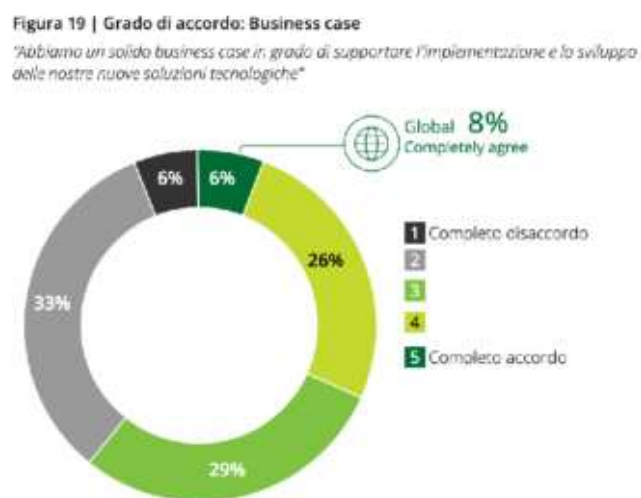


Figura 19 | Grado di accordo: Business case
*"Abbiamo un solido business case in grado di supportare l'implementazione e lo sviluppo delle nostre nuove soluzioni tecnologiche"*

Global **22%**
Completely agree

1 Completo disaccordo
2
3
4
5 Completo accordo

A possible explanation of this gap is that Italian firms, for their origin, structure and development, are more focused on short- or medium-term investments in operations and R&D. Global firms have more appetite for investments in both human development and technology.

Italian firms identify as difficulties of adopting new technologies the lack of financial resources and know how, while Global firms mainly the strategic short-term vision and collaboration of external partners.

Finally, another point that reveals differences between Italian and foreign mindsets, is the question: *"Is it necessary a reform of the national educational system?".*

The large majority of respondents in Italy said national reform could be the solution to catch up with I4.0 advances.

On the contrary, at the Global level, only 35% of respondents agreed to the need for a complete rethinking of the education system, while the remaining 65% answered *"Our current education system will generally continue to work for the challenges of the workplace".*

That is the difference: in Italy, managers believe more in a "Top-down" approach, a reform that comes from the "upper bodies", while foreign managers believe more in a "Bottom-up" approach, a reform that starts from the inside of the company.

Almost all respondents recognized the huge impact of new technologies in terms of human resources and organizational structures, but the majority of them (51%) considered the problem with urgency, and only a 49% declared it is a problem that should be fixed in the short term.

Only 8% of Italian respondents, in 2018, considered market changes as important for the future changes of organizational structure.

It is a relevant point if we consider the impact on Covid-19 pandemic on companies.

# V. Case Study: Fre Tor s.r.l.

## Structural lack of competence in a high-tech company. Collaboration with the outside to become the Factory of the Future

**Fre Tor as an innovative example for Italian SMEs**

In order to help Italian SMEs to become a "Factory of The Future" and to innovate in the industry 4.0 panorama, I decided to describe a case study of a company that did not implement industry 4.0 tools to innovate and increase efficiency of production processes, but that was born as strongly focused on the use of technological tools.

Fre Tor "anticipated" the trend and involved industry 4.0 tools even before they started to diffuse.

That is fantastic for an Italian medium enterprise.

However, Fre Tor is not a "superhero" or a special company that is able to find workers, operate with latest technologies, be efficient, effective, and successful in international markets. Fre Tor, like all SMEs described above, found (and is finding) difficulties in terms of competences, internationalization, formation. It also got worse because of Covid-19.

What Fre Tor has of special are not tools or organizational means.

It has a special attitude toward the client and toward all complex issues it faces.

Listening to Fre Tor experience could help Italian SMEs to go through the path of the *«Italian Way to Industry 4.0»* (Bettiol, Di Maria, Capestro, 2018).

**Location: Alpago.**

**A little focus on the problem of competences in Veneto region**

At the end of 2019, 44,5% of manufacturing SMEs (of a sample of more than 2000 companies taken by Unioncamere Veneto) has adopted at least one 4.0 technology, and others confirm that in some years they will adopt them, with the percentage reaching 54,7%.

In June 2020 the percentage was 52,6%, with the revision of estimates that grow, reaching 71,6% of SMEs that are programming to invest in 4.0 technologies. Covid-19 pandemic was a great accelerator of the phenomenon. Difficulties in communication and mobility, changes in consumption patterns and attention to quality, efficiency, reduction of waste, savings, increased the interest of companies in adopting new tools.

Enabling technologies that are of greatest importance for them are robotics and automation. Then IoT and cloud services.

In the following months, "4.0" SMEs have revealed to see a more rapid recovery, with higher foreign orders and performances than those that have not invested in 4.0 yet.

I would like to insert some of the charts to better explain the concept:

| | Non adottanti | Adottanti | Scomp. per n. tecnologie adottate | | | |
|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | più di 4 |
| **Settore di attività** | | | | | | |
| Alimentare. bevande e tabacco | 48,5 | 51,5 | 17,1 | 17,9 | 7,6 | 8,9 |
| Tessile. abbigliamento e calzature | 58,4 | 41,6 | 23,4 | 7,8 | 6,7 | 3,7 |
| Legno e mobile | 57,9 | 42,1 | 20,2 | 11,3 | 7,9 | 2,7 |
| Carta e stampa | 45,6 | 54,4 | 28,3 | 9,5 | 6,7 | 9,9 |
| Gomma. plastica | 38,7 | 61,3 | 24,3 | 13,4 | 11,0 | 12,5 |
| Marmo. vetro. ceramica e altri non metalli | 47,7 | 52,3 | 30,1 | 7,8 | 5,9 | 8,5 |
| Produz. metalli e prodotti in metallo | 43,0 | 57,0 | 27,4 | 13,4 | 9,2 | 7,1 |
| Macchine ed apparecchi meccanici | 46,0 | 54,0 | 19,3 | 12,0 | 8,0 | 14,6 |
| Macchine elettriche e elettroniche | 36,9 | 63,1 | 23,3 | 12,0 | 12,2 | 15,6 |
| Mezzi di trasporto | 34,4 | 65,6 | 16,8 | 26,6 | 0,0 | 22,1 |
| Orafo | 24,8 | 75,2 | 12,4 | 21,4 | 41,5 | 0,0 |
| Occhialeria | 46,6 | 53,4 | 17,7 | 5,7 | 0,0 | 30,0 |
| **Totale** | **47,4** | **52,6** | **22,9** | **12,1** | **8,5** | **9,0** |

Fonte: Unioncamere del Veneto - Indagine VenetoCongiuntura II trimestre 2020

Fonte: elaborazione panel dati Unioncamere su un sotto-campione di 911 imprese

| Robotica e Automazione | 53,9 |
| Industrial Internet, Internet of Things e/o... | 13,8 |
| Servizi Cloud – servizi di could computing... | 13,5 |
| Gestione e analisi big data | 4,8 |
| Sistemi di Produzione Additiva -3D | 4,2 |
| Gestione sicurezza informatica | 3,6 |
| Altro | 3,5 |
| Intelligenza Artificiale | 1,9 |
| Realtà aumentata - Realtà virtuale | 0,5 |
| Tecnologie digital twin | 0,1 |
| Sistemi Blockchain | 0,1 |
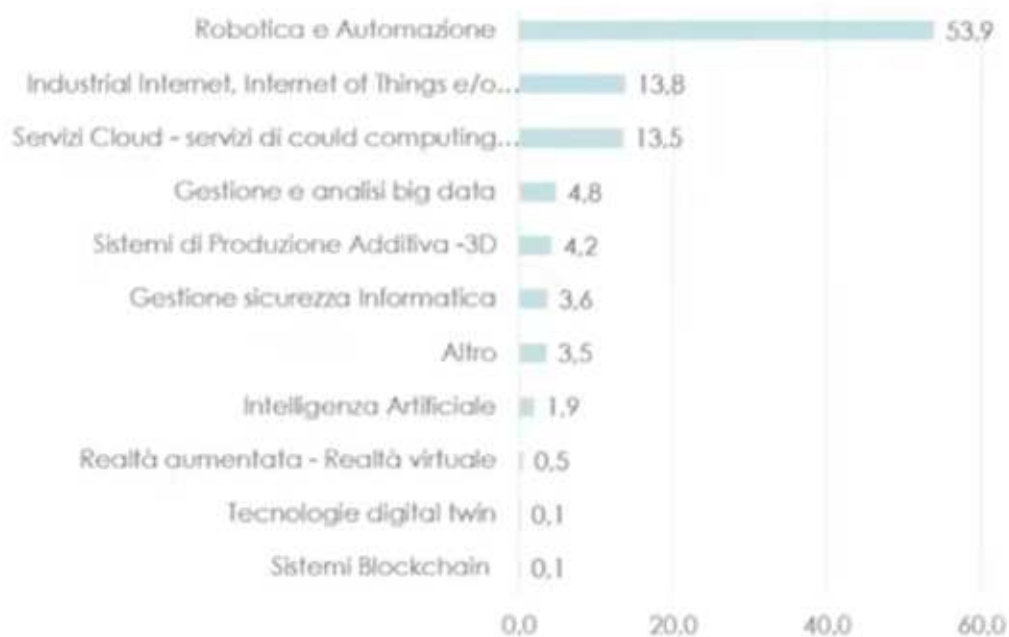
Fonte: Unioncamere del Veneto - Indagine VenetoCongiuntura III trimestre 2020

UNIONCAMERE VENETO

VenetoCongiuntura – Digit

Among these areas with a high number of adopters there is Belluno area; in that place there are also those who recognized the most the necessity of investing in skilled workers.

| | Non adottanti | Adottanti | Scomp. per n. tecnologie adottate | | | |
|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | più di 4 |
| **Province** | | | | | | |
| Belluno | 47,3 | 52,7 | 13,7 | 12,3 | 7,9 | 18,9 |
| Padova | 49,3 | 50,7 | 21,7 | 12,8 | 7,5 | 8,8 |
| Rovigo | 51,3 | 48,7 | 26,7 | 11,4 | 1,1 | 9,5 |
| Treviso | 49,3 | 50,7 | 23,3 | 11,8 | 8,2 | 7,4 |
| Venezia | 56,9 | 43,1 | 18,6 | 11,4 | 8,2 | 4,8 |
| Vicenza | 42,4 | 57,6 | 24,6 | 13,1 | 10,0 | 10,0 |
| Verona | 44,2 | 55,8 | 24,4 | 10,3 | 10,0 | 11,1 |
| **Totale** | 47,4 | 52,6 | 22,9 | 12,1 | 8,5 | 9,0 |

Fonte: Unioncamere del Veneto - Indagine VenetoCongiuntura II trimestre 2020

## Le tecnologie digitali adottate richiedono competenze specifiche su cui però abbiamo già investito\stiamo investendo

| Settore | |
|---|---|
| Alimentare, bevande e tabacco | 13,9 |
| Tessile, abbigliamento e calzature | 20,4 |
| Legno e mobile | 19,7 |
| Carta e stampa | 17,8 |
| Gomma, plastica | 21,5 |
| Marmo, vetro, ceramica e altri minerali non metalliferi | 10,9 |
| Produz. metalli e prodotti in metallo | 16,7 |
| Macchine ed apparecchi meccanici | 20,7 |
| Macchine elettriche e elettroniche | 15,7 |
| Mezzi di trasporto | 12,5 |
| Orafo | 18,0 |
| Occhialeria | 50,9 |
| **Totale** | **17,9** |

Belluno 39,3

Treviso 16,9

Vicenza 18,5

Verona 13,2

Padova 14,8

Venezia 27,4

Rovigo 21,6

Fonte: Unioncamere del Veneto - Indagine VenetoCongiuntura II trimestre 2020

**Description of the company**

*«From family-run to global. An evolution led by our clients.»*

Information below is the result of an interview conducted in December 2019 to Pajer Katia, marketing manager of Fre Tor s.r.l. and of a research conducted during an internship at the company in April 2021.

*History*

Fre Tor srl was founded in 1976 in Alpago (Belluno) by Gervasio De Col. The first aim was to manufacture precision mechanical components using milling machines and lathes. It is from this activity that the name originates: Fre (Milling, "Fresatura" in Italian) Tor (Turning, "Tornitura" in Italian).

The company can now be classified as a medium enterprise, with 65 employees.

Starting from the first years after the foundation, Fre Tor was able to develop its own know-how to be an important reference point in the fields of industrial automation, robotics, eyewear equipment and precision machining.
In the context of the eyewear sector, the company entered the market when Mr. De Col saw the opportunity in the changing world around him, as a consequence of globalization. After Fre Tor was founded, it started to create relationships with the other industries that were born in the same territory and so became able to sustain the competition and the increasing demand.

In 1980, for the eyewear sector, Fre Tor constructed a semi-automatic lens cutting machine, that is considered a milestone for the company.

The globalization process saw the convergence of a lot of countries to the same level of GDP and production processes, but also to the same business models, following the trends in outsourcing and offshoring. With changes in methods of

investment, ownership and the diffusion of technology, the company started to open to innovation, both at a national and international level, developing ideas and finding solutions to the more disparate problems. In that way, as a sequence of globalization process, Fre Tor started to look at the market as a whole, made by local and foreign clients, making requests about a lot of different problems. Hence, the company first started to involve not only operators but also clients and suppliers in the production of goods and services and, more in general, in the process of supply, distribution and after sale assistance.

In 1996, it produced the first fully automatic industrial machine for the loading and unloading of small components.

One of the main clients is, starting soon after the first times, Luxottica. To this "giant of the eyewear sector" Fre Tor supplied a large number of machines.
Luxottica gave Fre Tor the first opportunity of internationalization: it commissioned the start of the Automation Factory in China. Fre Tor considered the hypothesis of setting a plant there, but abandoned soon the idea, after having realized the scarcity of skilled labor in the field of automation.
Fre Tor more and more supplied machines from clients in all over the world, but never set a plant abroad.

The process of internationalization saw an important acceleration when the company became part of the Brovedani Group, a multinational of automotive components sector, through a partial acquisition with a capital increase. The Group, in fact, has plants in Italy, Slovakia and Mexico.

*An Industry 4.0 company*

We can say that Fre Tor anticipated the 4.0 trend, being born as a highly innovative company in the field of industrial automation.
During his visits to the customer Jury De Col, the CEO, realized that there was an increasing demand of intelligent machines.

Fre Tor can be classified as a company operating in the 4.0 field since it respects all the requirements indicated in the 2017 budget law:

Annex A1:

*«Machines must be equipped with all of the following features:*

1. *Control by means of CNC (Computer Numerical Control) or PLC (Programmable Logic Controller)*
2. *Interconnection to the factory IT systems through loading remote instructions and/or part program*
3. *Automated integration with the factory logistic system or with the supply network and/or with other machines of the productive cycle*
4. *Simple and intuitive interface between man and machine*
5. *Compliance with the most recent safety, health and hygiene parameters at work.»*

In fact, in Fre Tor:

1. All machines are equipped with an electronic system on board: CNC (that indicates specific paths that machines have to walk), mainly for work centers that perform mechanic operations, such as milling machines; PLC (that indicates the logic flow of operations to be performed) mainly for automatic machines, such as assembling ones.
2. All machines are equipped with a PC or a ROUTER, that talks with PLC and translate and make more understandable human-machine dialogue.
3. The PC permits the machine to indicate operations to perform, but also understand performed operations and communicate them to the following stations (for example: a machine orders to produce 500 pieces and then verifies. 499 pieces have correctly been produced, 1 is scrap).
4. Machines are constructed after a study of operator working habits, in order to simplify the use and respect all safety requirements. For example, Fre Tor created a machine to help the operator's work with Porsche taillight: it was too heavy to take it up and down the entire day. Without

specific indications from the client, Fre Tor tries to create standard machines, equipped with a simple interface, with continuity and homogeneity of symbols, titles, codes, that corresponds to physical components of machines. They have a set of "recipes": instructions that will help the operator with some productions, so to clarify the steps to perform. In addition, in the machine there is the manual of instructions and video tutorials for less frequently performed operations. The interface is characterized by simple colors that indicate the priority of dangers. The access is limited to authorized operators.

5. All machines obtain a "CE" marking (European Conformity), that indicates conformity with health, safety and environmental protection standards, compulsory for machines of the European Union. Extra-CE machines follow destination country laws. Before making an offer to one client, Fre Tor examines the norms and materials to be used. In addition, each component receives the CE marking.


Annex A1 continues:

*«All machines need to be equipped with at least two out of three of these characteristics:*

*1. Remote maintenance and/or diagnosis and/or control systems*

*2. Continuous monitoring of working conditions and process parameters through appropriate sets of sensors and adaptation to drifts of process*

*3. Integration characteristics between physics machine and/or plant with modelling and/or simulation of one's own behavior in carrying out the process (cyber-physical systems).»*


1. Fre Tor machines can permit remote telediagnosis and/or control thanks to the PC or ROUTER.
2. Fre Tor guarantees the monitoring of sensors of machines. Specific collection of data could permit to perform predictive maintenance that is,

however, difficult to implement on Fre Tor machines, since each machine is different to the previous one, and so are the problems.

3. The cyber-physical system is not implemented in Fre Tor: no one of the clients need a virtual operator. There is, then, the possibility to put the machine in a virtual world, but Fre Tor have decided to do it only for more complex machines.

*The structure*

| | PRESIDENT | |
|---|---|---|
| | | |
| HR, IT Relationship with Brovedani Group | **CEO** | |
| | | |
| **MARKETING** | | |

| Commercial director CLIENT | | | Operational director MANUFACTURING | | | | Administrative director GENERAL ACTIVITIES | | |
|---|---|---|---|---|---|---|---|---|---|
| Relationship | Quote | Post sales | Design Mecc/ El. / Sw | Production | Purchase | Planning (project) | Administration | Management control | Safety, quality, environment |
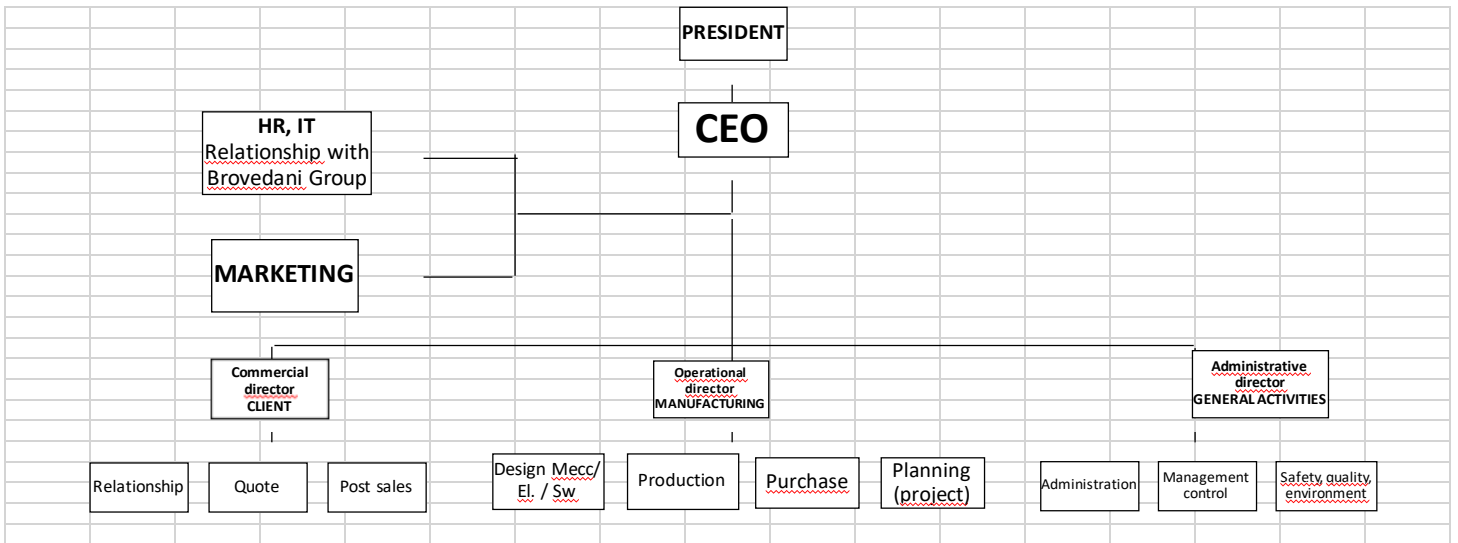
*Products and services*

Fre Tor realizes a large variety of products and services, since it creates them in a unique way for each client. It is not so common that one client arrives with the same request of the previous one. Fre Tor has to understand the needs and translate them into reality. However, it has tried to create a "list" of products/service offered:

- Consulting: preliminary listening of client's problems
- Pieces: single parts of machines (ex. spare parts or other single components)
- Entesol: standard structure of standard components of the machines, flexible and adjustable for different sizes, materials, shapes

- Frame: machines for the eyewear sector

- Automation: other machines

- Service: maintenance, implementation, recipes, replacements of spare parts

- Replica of a machine realized in the past (with adjustments and betterments).

Some examples:

- **Entesol:**
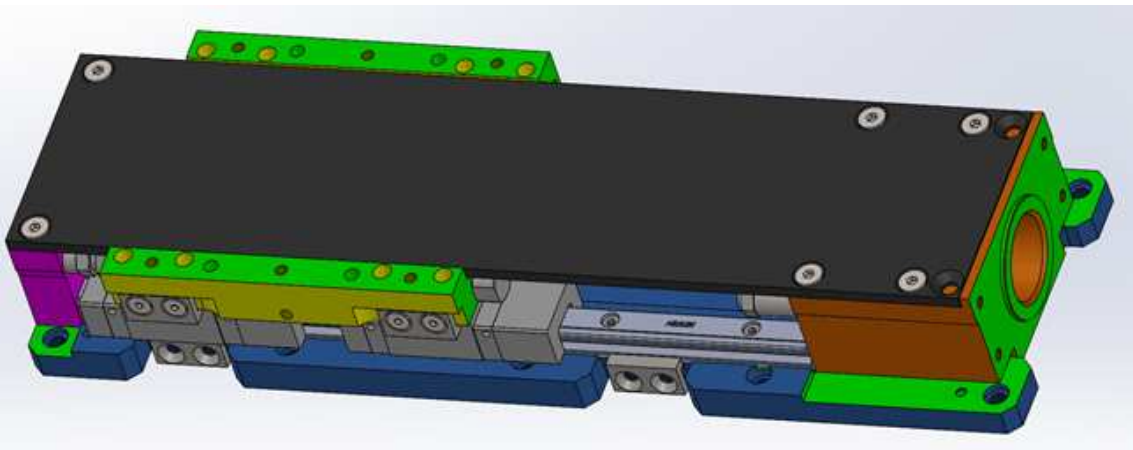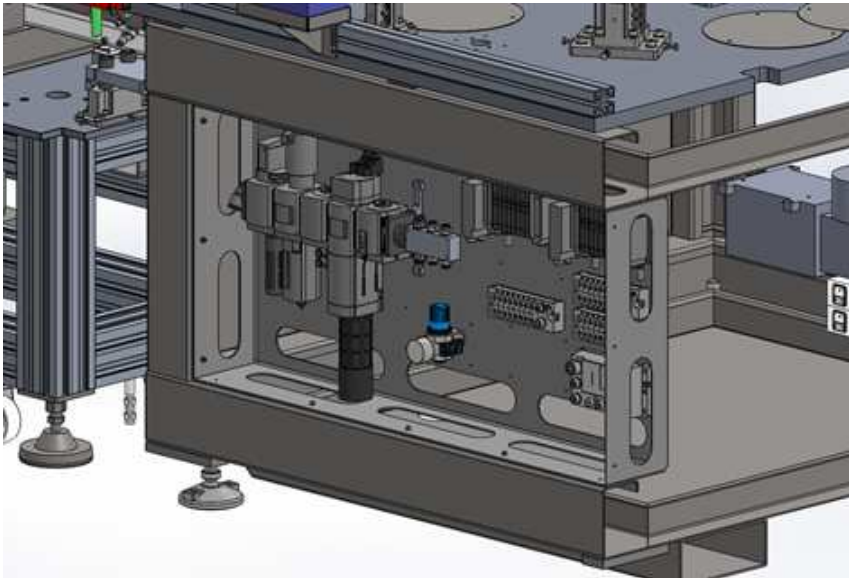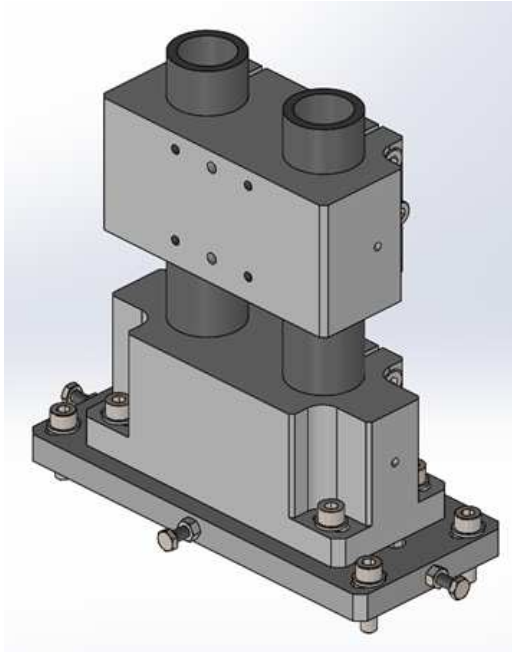
- **"Frame 8: Depth milling machine for temples and fronts",** a thickener for rods and tablets, that performs the desired CNC thickness of temples or bars for plastic eyeglasses.



- **"Frame 11: Core Temple Shooting Machine"**, to insert metal cores in acetate strips through a configurable high-frequency system.

- Automation carried out at the client factory, household appliances sector: assembly of gearmotors for dishwashers



- **Automation for a client operating in the same sector:** assembly of burners with copper pipe and aluminum ramps. Expansion with ogive.

- **Automation for the furniture sector:** for the construction of metal guides for drawers. This automation is one of the most important success of Fre Tor, with a particular and long process of co-design. The final result is an extremely big automation, realized in San Vito Al Tagliamento.
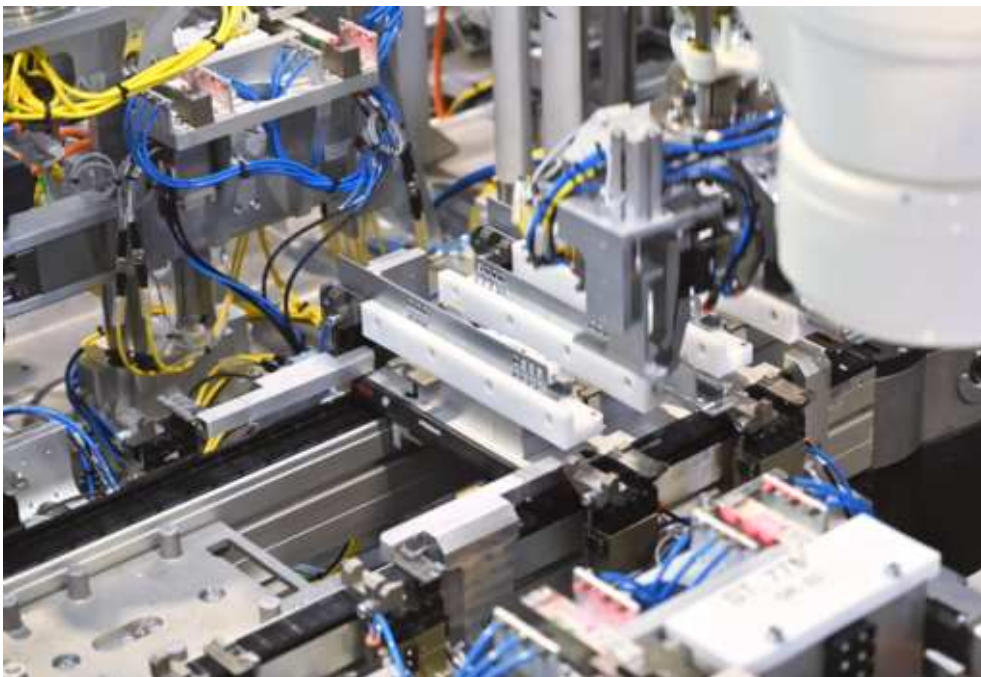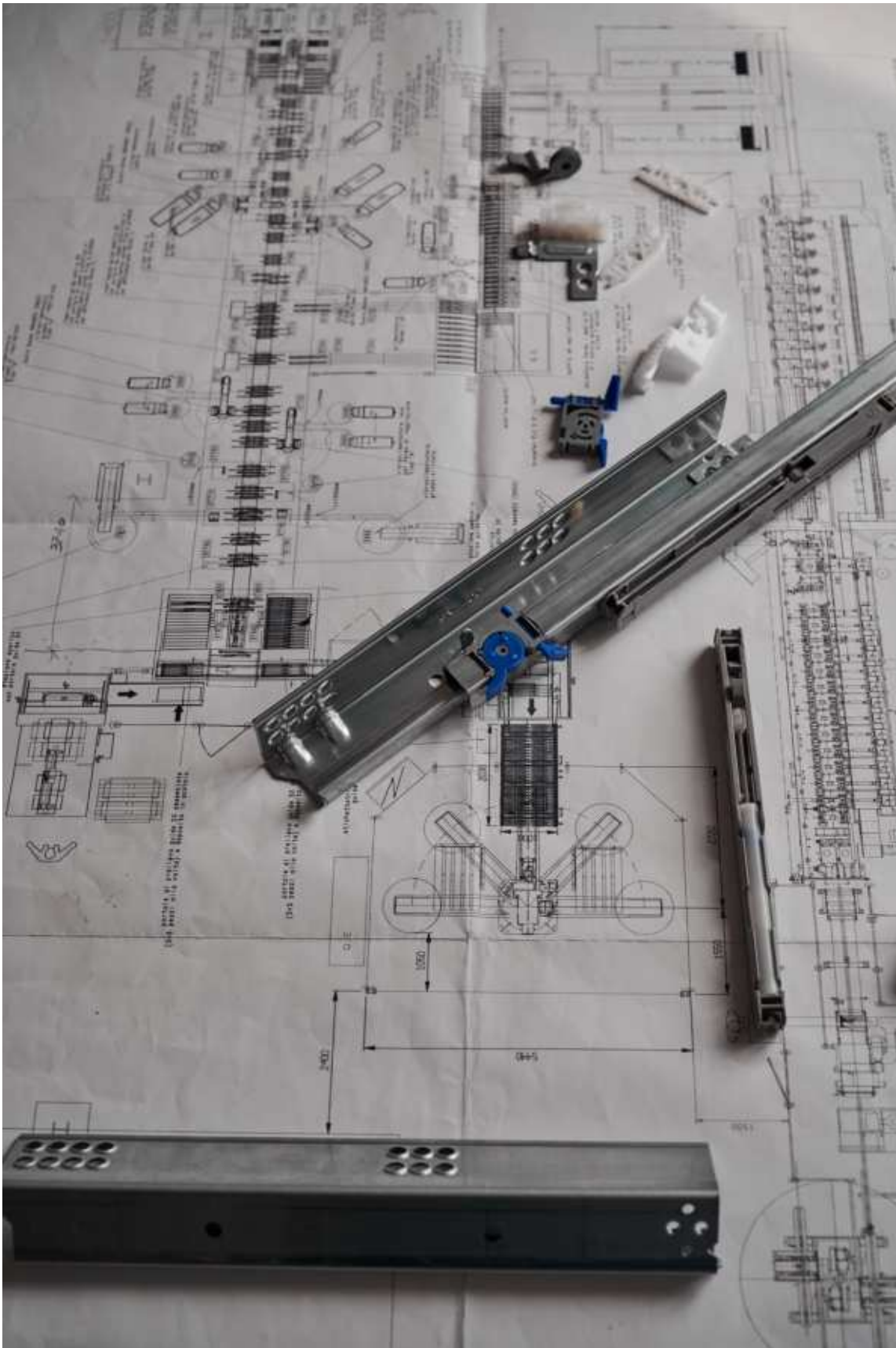
*Co-design: the client arrives with the pieces, explain the process, and Fre Tor designs with him the solution.

- **Automation for the eyewear sector:** crystal lens finishing line (coding and marking). Application of the data matrix on pallets for lot traceability.
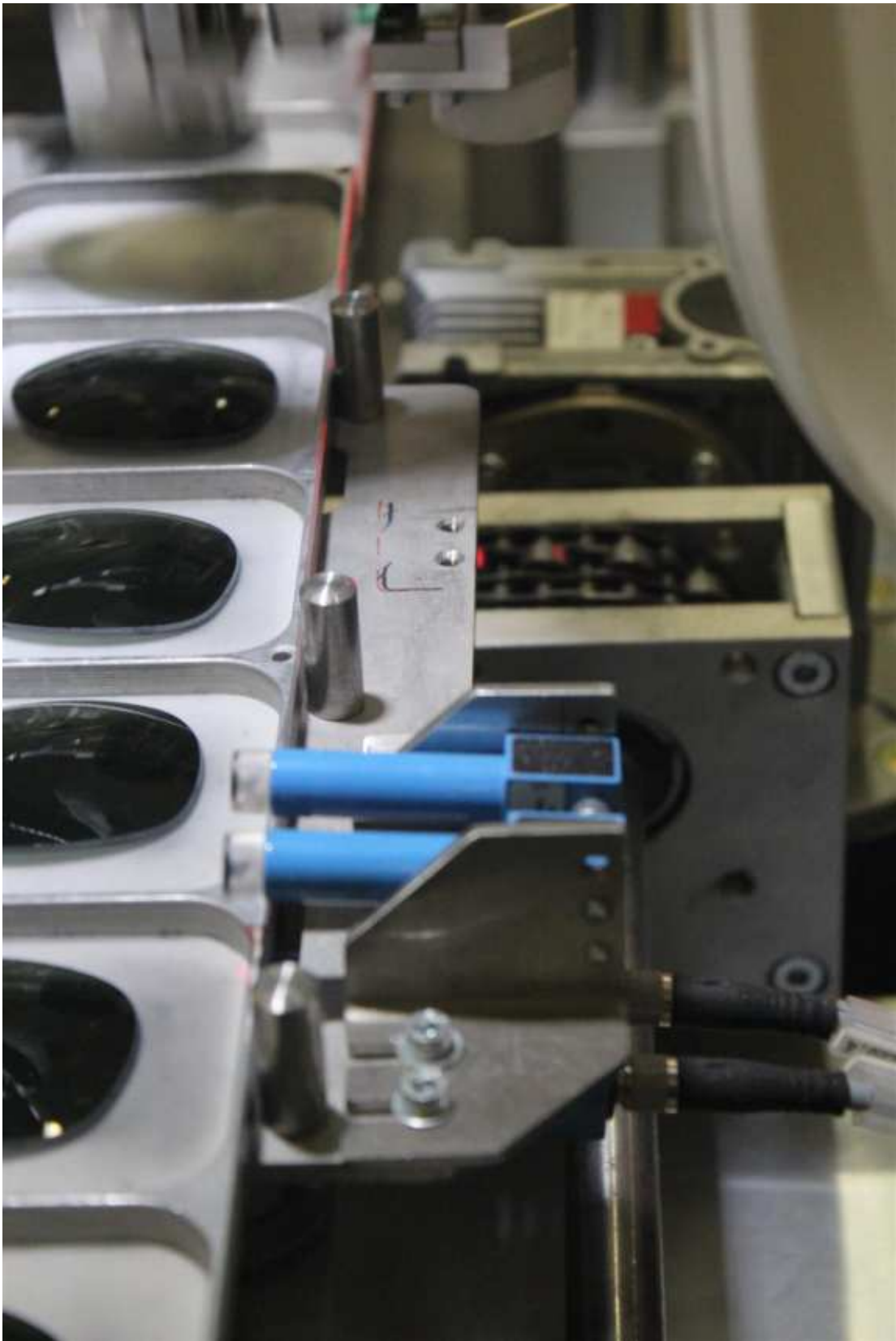
*Concept of traceability, datamatrix

*Some Additive Manufacturing works*

- Development and production of a system for the aspiration of copper shavings in the operation of calibration by removing shavings, of the height of the heat exchanger tubes.
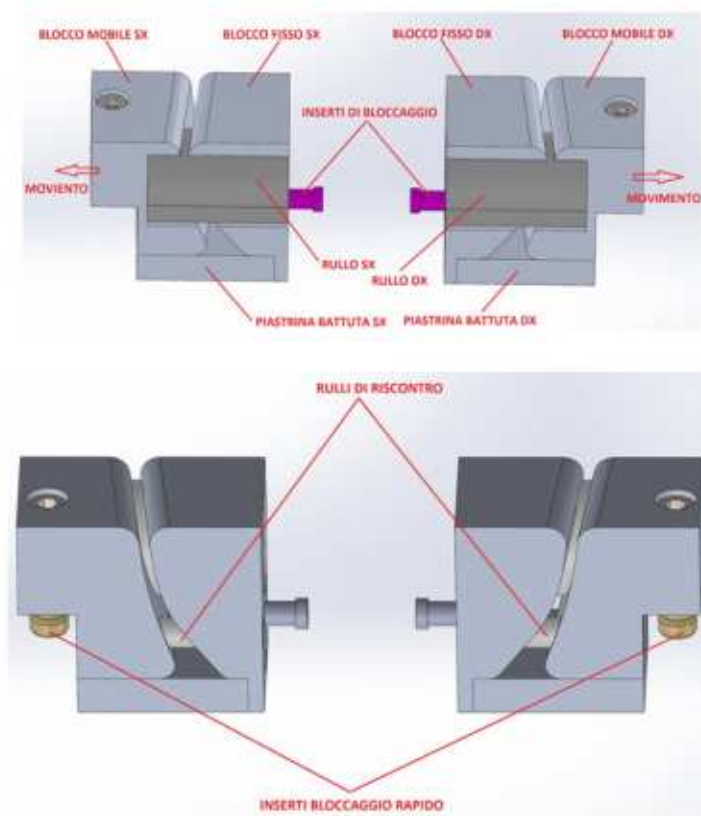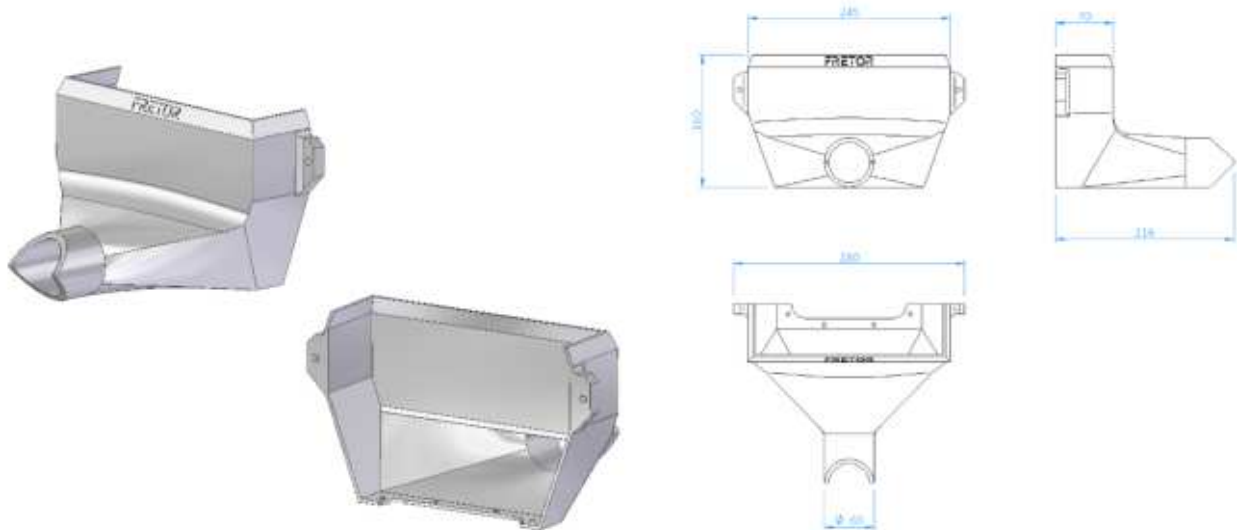
- Lightened grippers, through latex structures, that decrease the weight and increase the rigidity.
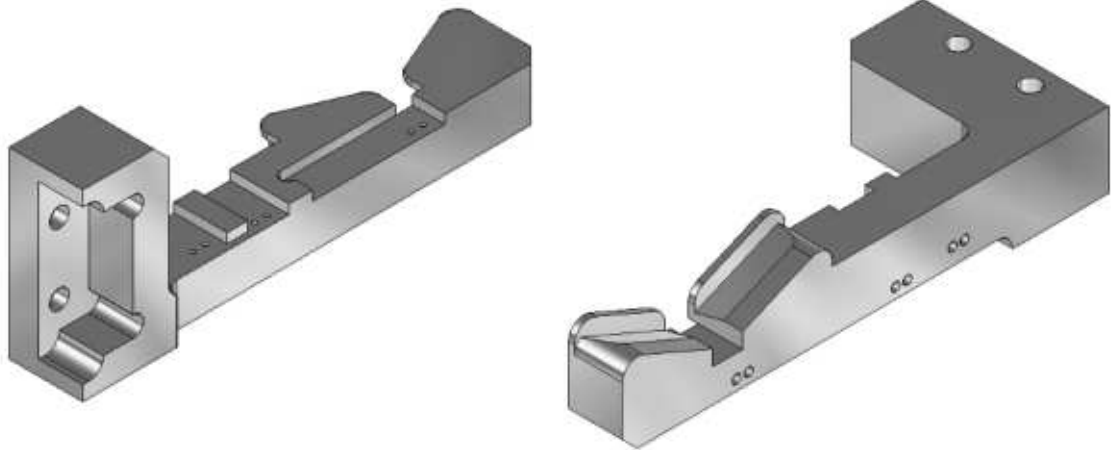


- Carter for the protection of a transmission of a conveyor belt.
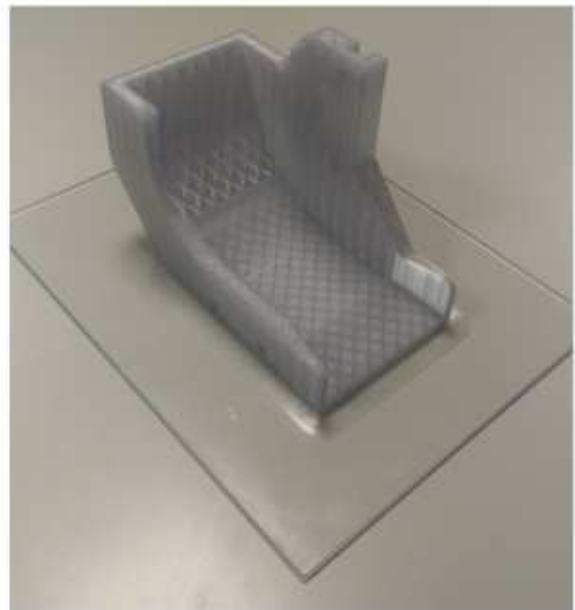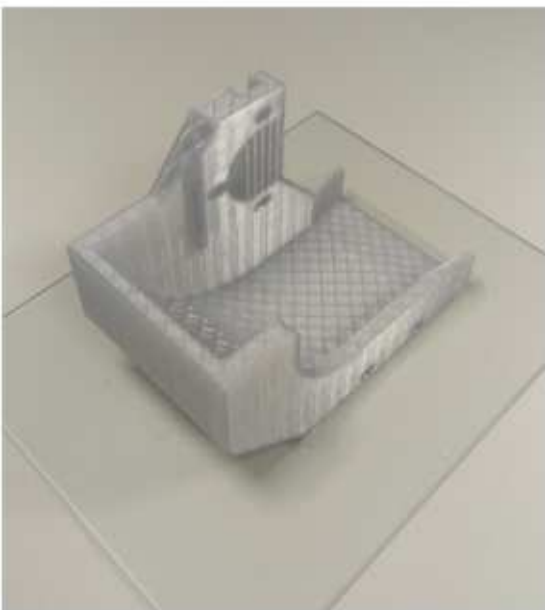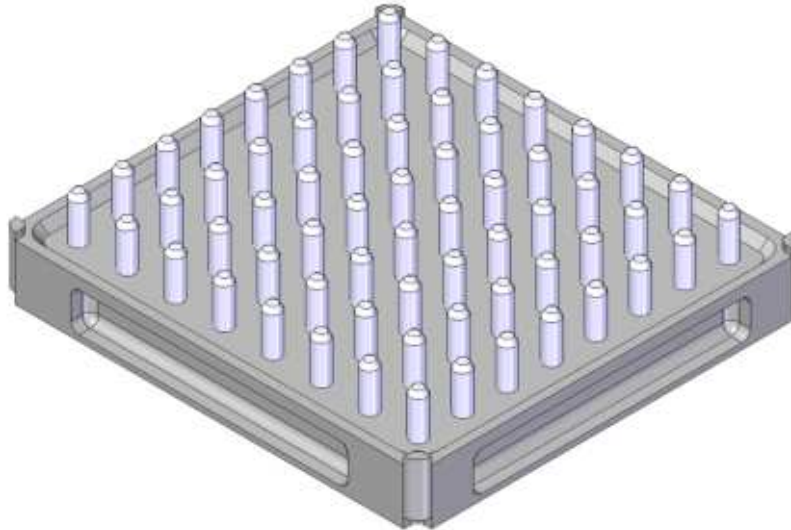
*Processes*

- Consulting
- "Avamprogetto": preliminary considerations about the solution proposed to the client
- Design: practical realization by the technical office
- Manufacture
- Assembly of pieces and groups to create automations
- Service
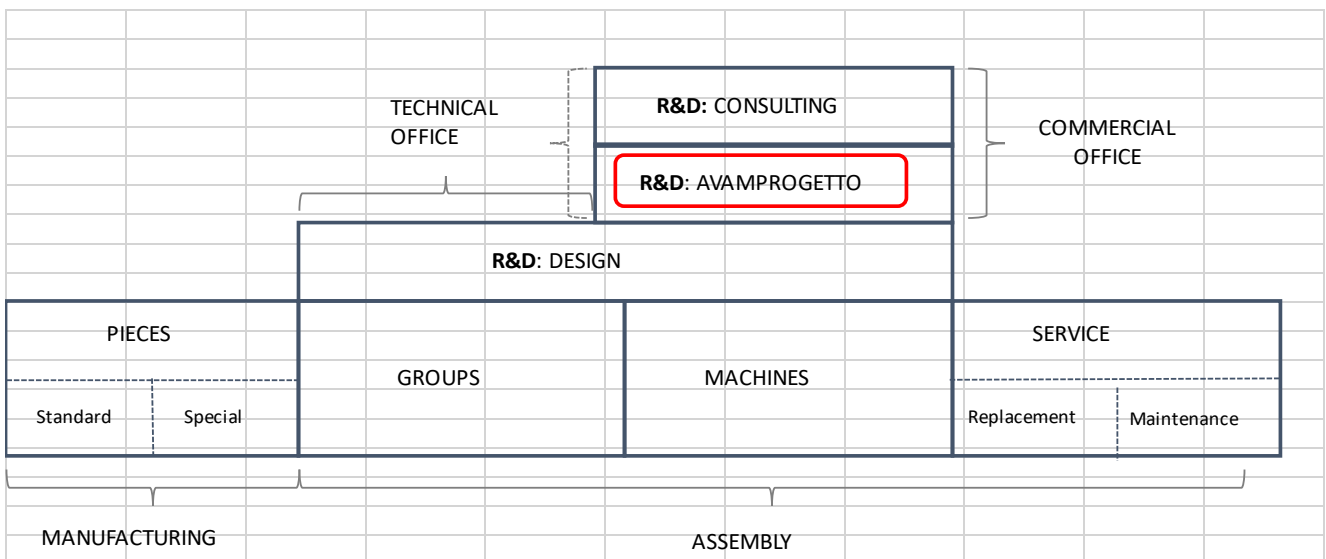
*Suppliers*

They are mainly vision systems manufacturers, PLC and robots' producers, long-term suppliers of equipment.

*Clients*

They are manufacturing companies, that need to reduce the effort of humans in their production processes.

Clients are not recognized for their sector, but for their dimension: more than 100 mio eur revenues in the European territory.

The client profile can be synthesized as:

| Dimension | Product | Method of contact | One shot | We have specific competences | Location | The company has already had experiences in automation | The company is already oriented towards automation |
|---|---|---|---|---|---|---|---|
| Dimension (1 for 250 for >1000) | Annual volume (1 for 250K / year - 10K for > 15 Mil/year) | Method of contact | The client buys regularly automations | Fretor has specific competences that satisfy the request | The client is in a position that could be reached easily | The company has altready experiences in automation | Trhe request comes from an «active» project or is only scouting for future investments |
| 1=50 people 2 =100 people 3 =150 people 4 =200 people 5 =250 people 10 > 500 people | 1 for 250K / year 5 for 1 Mil / year 10 for 15 Mil / year | 1=Contact with Fretor 5 = Casual meeting 10 =We have been contacted | 1=One shot 5 =Not relevant since potential 10 =Frequent | 1=No 5 = Similar processes 10 = Experience in the same product | 10 =1h 9 =2h 8 = 3h 7 =4h | 1=No, only manual 5 =1 assembly line 10 = more than one line | 1= Generic 5 =Cost / Benefit evalution 10 = Real project |
| 5 | 5 | 10 | 0 | 3 | 4 | 0 | 0 |

Some clients are:

| | | | | | |
|---|---|---|---|---|---|
| Aprilia | | Ferrari | | Oakley | |
| Assa Abloy | | Ikoi | | Osram | |
| Automotive Lighting | | Ital-lenti | | Otlav | |
| Biosigma | | Linz Electric | | Pedrollo | |
| Campagnolo | | Luxottica | | Permaflex | |
| Clerprem | | Marchon | | Pfitscher | |
| Coster | | Marcolin | | Safilo | |
| Dana | | Mazzuchelli | | Schneider Electric | |
| Danieli | | Molex | | Stevanato Group | |
| Ebara | | | | Unifarco | |
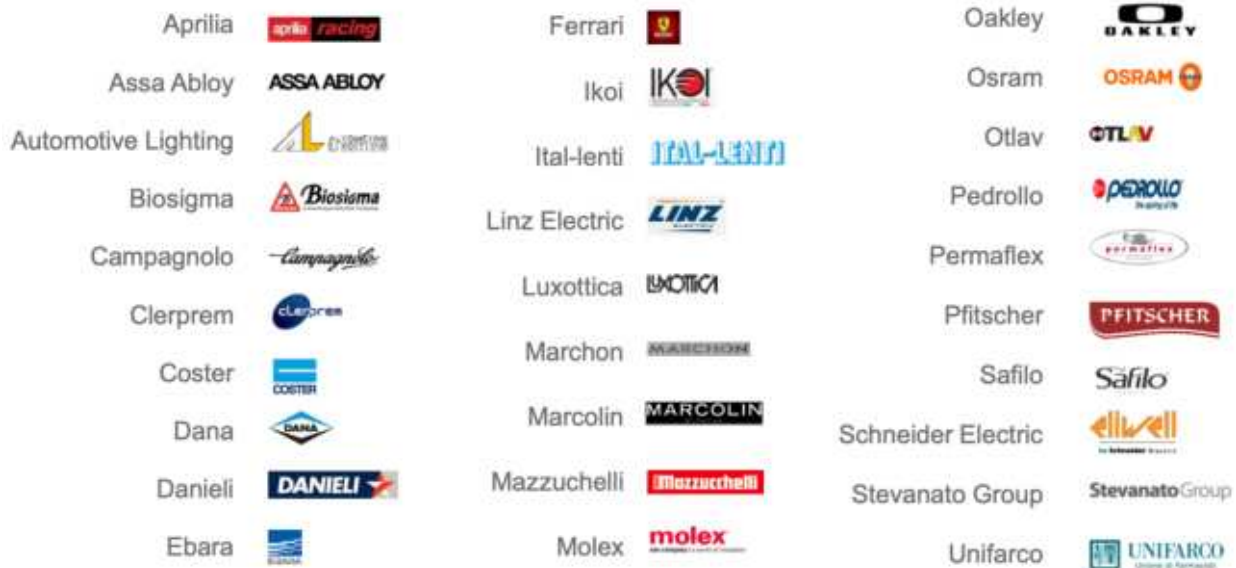
*Competitors*

For services, revenues, location, employees, sectors, main competitors are:

- Sgm: eyewear sector automation, production of glasses. Milling, cutting, finishing, assemblying, bending, welding.

- Sinteco: industrial and hospital automation systems. For the variety of sectors served, it is one of the main competitors of Fre Tor. In addition, it does not only offer solutions, but also consultancy. Sinteco, especially because of the offering to the medical sector, has a great attention to quality and cleaning standards. Like Fre Tor, it offers periodic reviews with the clients, fmea analysis, project management, maintenance. It offers plants for the assembly of industrial components in sectors like automotive, mechanics, electronics, medical.

- Cosberg: automation for assembly processes. It serves electromechanical, pharmaceutical, medical, cosmetical, eyewear, watchmaking, automotive, home, electronics, furniture sectors.

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- Tvm: robotics and automation for industrial processes. It offers ideation, design, assemblying, installation, maintenance. It offers special solutions for the eyewear sector, through technologies cam, cad, plc, laser, hf, cnc, ultrasound.

*Mission, Vision, Values*

Today, its markets of expertise and areas of application involve the pharmaceutical industry, the automotive field, the medical business and the aerospace industry.

The corporate structure, formed by a highly qualified team, allowed from the first times the identification of optimal solutions through the study, the design and the construction of machinery and automated systems with high technological value. The application of the quality system and support services, before and after sales, are the guarantees that Fre Tor offers to its customers.

The great relational capacity is, in fact, one of the main strengths of the company. To maintain it, Fre Tor tries to involve the client as much as possible in order to deeply understand its needs and consequently customize special plants and machines. Fre Tor takes care of its clients from the beginning to the end, never leaving them alone.

Its mission, its vision and its values can be synthetized in some words: *"Passion, Dedication, Precision"*. Its innovative spirit is expressed by the creation of high-quality automation and robotics systems and with the constant pursuit of technological excellence through the application of the "Kaizen" method (lean management, involvement of all the departments in the production process).

It *«works to get the best product».* The company is constantly committed to offer clients (that are mainly companies, since it works in the b2b business) the best solutions at low prices, giving them the possibility to become leaders in their sectors.

*«The diversity and uniqueness of the models that we produce, like what is seen in the tradition of the best Italian craftsmanship.»*

In addition, Fre Tor guarantees the traceability in the supply chain through the application of the data matrix to the products (when the client asks for), so to permit it to understand the origin of bugs or other errors that could occur.

In order to demonstrate the importance of values in the company, I would like to share the official value chart of the company:

*«Customer satisfaction for our work make us proud to be part of Fre Tor, aware of commitment, precision and obstinacy that every day we put in the design and realization of our products.*

*We provide our clients technologically advanced and customized solutions, giving them what our competitors do not give.*

*The study of the most suitable solution to the customer's needs involves a 360° design of the systems with meticulous attention to ergonomics and working environment.*

*The service supports each client by intervening every time a technical or logistic difficulty arises, that requires professional and timely support, making personal every request.*

*We love to test ourselves, marveling at the richness contained in each diversity:*

1. *Of the companies that choose us, coming from different sectors, each with a different size*
2. *Of the models we create, which arise from the tradition of the best Italian craftmanship that meets the innovation of new technologies*
3. *Of our collaborators, each specialized in following a different phase of a project.*

*In Fre Tor, collaboration and support between colleagues are always stimulated. Creating and maintaining a close-knit team is an integral part of one's job.*

*People are an asset, and for this reason it is a pleasure for us to invest in their professional growth. The future and efficiency of Fre Tor also depend on the foresight and curiosity expressed everyday by each of us.*
*Fre Tor cares about the health of all its employees. Security is a right and duty of each of us.*
*For Fre Tor automation means giving to every man and woman the opportunity to love their work even more.»*

*Fre Tor competitive advantage: personalization of the product and trust relationship with the client*

FreTor mainly invest in innovation in order to develop new technologies and new methods of production. Innovation helps the company to grow, but also to face social challenges, achieve sustainable development, and pursue strategic objectives.

*«The precision and the pride of the artisan drive toward innovation and technologies.»*

Fre Tor opens its doors to innovation through the **"Co-design"** method, involving not only operators, but also clients and suppliers in the process of finding best solutions to problems. The company, with the co-design method, is able to offer different solutions to different needs and offer customized machines. They brainstorm different issues and make collaborative research, changing the traditional designer-client relationship.

Being so client-oriented, Fre Tor found perfect client-service combinations in order to draw the attention on the process of "servitization". Services had gradually assumed a very important role in the creation of value for a manufacturing industry and in the impact on profits. With globalization and the evolution of the new business, clients are no more merely searching for "products", but they are searching for "values". The process of servitization stands

for adding value to physical products with the provision of a service, and Fre Tor is striving at doing it in the best possible way.

This helps Fre Tor to maintain its know-how: not only are customers willing to share the workload of ideating, designing and marketing products, but they will also be more loyal, and willing to pay a premium in many instances.

Productive processes of clients become more efficient thanks to Fre Tor automations.

The client, however, has to take into account the high costs of machines, that is made mainly by the planning and design part. Fre Tor shares the costs with the clients, that have to face also a high variety of risks, directly proportional to the benefits that could be obtained: efficiency for the client, reputation for Fre Tor.

Let's try to understand the Robotics process:

1. Consulting service and preliminary draft.

The consulting service characterizes the first phase of developing special automatic machines and plants. It provides a synergic approach with the clients, by co-designing the product. By observing the needs from the production point of view, the company proposes different solutions to reach the best concept for each different client. The preliminary draft has different steps:

- Identification of needs and goals of the client
- Brainstorming of the different issues
- Analysis of the materials
- Implementation of the initial project with 3D CAD
- Debate with the customer
- Purchasing and assembling the components
- Software and electrical installations
- Final inspection with client
- Installation and training course.

2. Engineering: robotic systems and machines designing.

Building special machines, automation systems and industrial robots is what the company is known for, and designing is the most important phase. Specialized technicians and engineers follow the philosophy of co-design, from the analysis of needs and ideas of the client to the design of tailored projects. The 3D design and renderings allow the company, thanks to the best CAD technology and developed software such as Autodesk, Inventor, Think Design and Ige Xao, to evaluate the whole project virtually and avoid any possible construction errors, offering the clients the possibility to give shape to their ideas.

3. Robotic Automation.

It identifies the automation technology that uses control systems to manage machines and processes, reducing human intervention. Fre Tor uses robotic automation in four main sectors: Automotive, Medical, Eyewear, Aerospace.

4. Mechanical components manufacturing: CNC milling process.

The production department is equipped with CNC machines (lathes, mills and rebore equipment) and EDM wire devices, which allow to produce any kind of mechanical components. The materials Fre Tor uses are steel, metal alloys, bronze, titanium, brass and plastic materials.

5. Industrial automation services: Testing and maintenance of automated machineries.

The skilled technicians of the firm's customer service ensure an efficient and fast support on the automated systems and machinery they produced. Before the release, testing of automated machines and equipment is fundamental. The after sales service organizes periodic and preventive maintenance intervention on machineries and device using a remote-control system, which allows the technicians to act by remote stations. This solution ensures the timely intervention and also a good way to control the production and the process.

*Fre Tor challenge and Fre Tor Book*

In maintaining traditional values, the company is committed in translating complexity of clients into simplicity, through a perfect human-machines integration. Flexibility is at the basis of this process, that permits to understand "tacit" complexities of the client and transform them into codified knowledge of the machines, through a path of growing, development, sustainability. The machine becomes efficient, but also flexible and reconfigurable; the company believes in the set of knowledge of past experiences, grouped inside the "Fre Tor Book", a book about the history of the company creations. This book is considered as a very important patrimony: the basis of each work realized by Fre Tor and the road to transform the old into the new. The company operates through a process of:

1. Knowledge exploration
2. Consideration about the standard solution
3. Development of new skills
4. Knowledge exploitation

When performing this process, the operator obtains, through the years, a process of requalification: industry 4.0 does not remove job possibilities, but it creates new and more complex tasks.

The real challenge of the company is to try not to lose the knowledge of past experiences and to use it to evolve. Fre Tor have to execute the act of "thinkering", to think about what has been done to do new things (Micelli, 2016).

Fre Tor Book is the perfect instrument to do it.


*Sustainability*

For the company, sustainability is not only a set of standards to respect: it is a goal.

Clients perceive benefits in terms of safety of operations performed and working environment. The company is constantly committed in offering the best working conditions in a clean space. Unlike traditional factories, in Fre Tor we will never see oil or other waste liquids under the machines.

In particular, the company is committed in:

- Social Sustainability: safety and reliability, requalification of workers, formation and acquirement of new competences, reduction of injures, attention to oil, gas, and other toxic emissions or light expositions
- Environmental Sustainability: reduction of waste through the kaizen method (lean management) and machines idleness reduction
- Economic Sustainability: reduction of manpower costs, spare parts, time (time of production and time to market).

In terms of ISO (International Organization for Standardization), Fre Tor has:

- ISO 9001: International standards for Quality Management Systems, with a set of processes, procedures, documentation that need to be assured.
- ISO 14000: environmental protection techniques and environmental management
- ISO 18000: safety and health protection of workers.

**The problem of lack of competence and other connected issues: organizational change**

As a result of globalization and growth of the company, some issues started to come out:

- Difficulties in maintaining the direct contact with the client because of the long distance from Fre Tor and the rest of Italy (the territory of Alpago is in Venetian mountains and it is some miles away from clients' companies)
- Difficulties in maintaining partnerships because of the long distance from Fre Tor and specialized technical districts
- Difficulties in finding specialized competences in Alpago territory, that could be able to perform the more and more complex tasks requested by Industry 4.0
- Difficulties in making people relocate in Alpago
- Difficulties in providing suitable formation to current employees, since it implied a temporary stop of the plant
- Difficulties to expand abroad, without dedicated employees and competences.

*The opportunity to solve the problem and the entrance in Brovedani Group*

During an exhibition in 2010 Jury De Col and Sergio Barel, the president of Brovedani Group, a multinational specialized in the production of components for the automotive sector on an industrial scale, shared reciprocal concerns: Brovedani would have liked to open to the market of special automations but lacked the effective specialization to do that; Fre Tor would have liked to expand abroad and find new talents.

The multinational recognized the benefits of incorporating together a company characterized by large volume of sales at low margin (a single components is sold at 0,0006 eur) and one company that realizes low volume of sales at high margin (unique automations, each one personalized for each client, sold at millions of euros).

Fre Tor and Brovedani values seem to coincide: the importance of efficiency of production processes.

De Col and Barel decided to collaborate and finally, in 2018, Fre Tor entered the Brovedani Group through a partial acquisition with a capital increase.

Interest for the client and the relationship of trust has always been the distinctive character of Fre Tor.

The company has always been able to understand, thanks to a perfect listening of the client, his request, and offer him the possibility to increase the efficiency of the production process.

Passion and commitment of De Col and his fight for the defense of values, have always been constituted the development engine of the company.

Now that Fre Tor has to share part of the work with Brovedani, the organization has inevitably to change.

*Organizational change*

With the entrance in Brovedani Group, Fre Tor started to see an acceleration of its presence in the international scenario.

In order to effectively collaborate with Brovedani, values, views and work have to be aligned.

As a result, Fre Tor started to perceive an increment of confusion inside the organization: the fine but strong line that stood for years and that constituted the success of Fre Tor could be in crisis with someone that impose mutations.

The main changes that Fre Tor sees are:

*Opening of a plant*

In San Vito al Tagliamento (PN), near Brovedani ones.

In that place Fre Tor should have gathered the biggest orders in terms of dimensions and no offices. Because of organizational delays, the difference between Alpago and San Vito is actually not so strict.

*Intercompany contract management*

with particular attention to prices, tariffs, markup.

*International orders management*

Fre Tor clients are now in Slovakia and Mexico, but also more and more in the rest of the World (America, Europe, Turkey). The company has to take care of all bureaucracy of international orders: incoterms, certifications, clearance, contracts, nomenclature, classifications, duties, documents and invoices issue within the month of competence (with a difficult integration with foreign bureaucracy). Some particular cases are:

- Packaging for international shipments: the company has to take care of particular packings according to the distance that a product has to travel and the means of transport. For example, a lot of Fre Tor automations are shipped to Mexico by sea, so the box has to resist to rain, humidity, dents, and the transported product (machine) needs to be protected in the components that could get damaged for the salinity of the water, too.

- Specific use certification: some machines realized by Fre Tor need this certification, emitted by the government, that specifies the purpose. For example, a machine "Robodrill", which destination was Mexico, works with a three-axis system for the construction of tires. The mechanism could have been used for the creation of weapons; without the specific use certification, the machine could not have crossed the border. The license "dual use machine" was issued by the National Authorities UAMA (Military Goods Authorizations Unit) and MISE (Ministry of Economic Development).

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*Collaboration with Area Science Park and Public Administration orders management*

Some of the new orders are under the bureaucracy of public tenders. As a result, Fre Tor needs to be careful with the documentation required, in particular the correct use of CIG code (Tender Identification Code) and CUP code (Unique Project Code), to identify contracts or investment projects stipulated following a call for tenders.

For example, Fre Tor started to collaborate with **Area Science Park** (Trieste), the Scientific and Technological Research Area, a national public research body. ASP activities are: scientific and technological park; enterprise generation and support for business ideas; innovation and complex systems, with the creation of innovation systems for enterprises support; technological platforms to support research activities.

ASP has invested in projects for the **Lean Experience Factory**, an experiential formation center in San Vito al Tagliamento, created in partnership with McKinsey. The factory can be considered as an Italian **"Digital Innovation Hub"**, involved in the formation of companies, but also of students from Technical Schools, being a "laboratory for industry 4.0 education".

Fre Tor, for this purpose, has realized a machine that will be used for students' 4.0 formation, a "Work center (CNC) for the development of experiential training courses". The machine will interface with a collaborative robot and students taking part in LEF projects will use it to do direct 4.0 experiences.

*Recruitment of new employees*

Fre Tor passed from 42 to 65 employees. However, difficulties in finding qualified 4.0 personnel are still important for the company.

*Definition of "Talent" and its enrolment*

The company, despite the difficulties in finding them, has clear in mind what "Talent" means:

*«The one who, besides specific competences, through method and commitment tries to enhance his aptitudes and strengths, while improving his weaknesses.»*
(Andrea Del Rizzo, HR Director Brovedani Group spa, 15.01.2021)

For Fre Tor and Brovedani, the perfect candidate needs not only technical competences, but also the so-called "soft skills". The talented person needs to be:

- *«Curious and willing to learn*
- *Transparent*
- *Reliable*
- *Aware of himself and of his strengths and weaknesses*
- *Assertive*
- *Open to innovation and digitalization»*

In order to attract that type of talent, the company has stated a **"betterment strategy"**, that involve:

- Networking and partnership with Universities and Technical Schools, with visits to the more representative institutes
- Participation to Career Day of Universities
- Participation to conferences and professional orientation meetings, covering the role of teachers or testimonials
- Use of Social Networks (LinkedIn) for the promotion of the company and its initiatives.

*The problem of competences*

Fre Tor has relationships with Universities and Technical Schools. For example, one project engineer was hired after a stage from Ca' Foscari; a software engineer was hired after a stage from Kennedy Technical School of Pordenone.

However, the collaboration with Brovedani has not solved the problem of competences.

Fre Tor has still difficulties in hiring suitable employees.

In fact, we can read some of the company's quality indexes:

- 2019, 1st quarter, interviews-hiring ratio: 30/6
- 2019, 2nd quarter, interviews-hiring ratio: 40/5
- 2019, 3rd quarter, interviews-hiring ratio: 40/2
- 2019, 4th quarter, interviews-hiring ratio: 32/2

And the situation has only got worse in 2020 and 2021, with Covid-19 pandemic:

- 2021, April, interviews-hiring ratio: 30/2

Some of the reasons could be:

- The effective separation between San Vito and Alpago has not been implemented and a large part of the work of machine construction remained in Alpago: candidates prefer not to move to a mountain area.

- The type of work has become more complex, following the increment of complexity of Industry 4.0 tasks. Jobs are evolving at a speed higher than student's formation.

- Fre Tor offering is a unique and personalized product. To be client-oriented is a prerequisite for all candidates. Extreme precision of work is what will determine client's satisfaction and few candidates want to take the risks of the "unknown" future orders. A lot of them prefer the certainty of repetitive tasks.

- The initial plan was to grow internationally, so "hire people abroad for the abroad". Because of Covid-19 pandemic and organizational problems, the actual condition is still "hire people in Italy for Italy".

*Measurement of competences*

Fre Tor and Brovedani started a project called **"It is forbidden to lose Talents"**: HR personnel is required to *«Constantly measure skills, climate and values, adapting the skills of existing staff to new tasks deriving from digitization, contributing to the change of the organizational structure according to the Business Plan»* (Del Rizzo, 2021).

Employees' competences are periodically evaluated through a platform appositely developed for Brovedani Group; in that platform HR personnel is required to insert grades and betterment indicators of employees under his sphere of competence.

In addition, the company has started a project named **"Ambassadors of Value"**: people in the inside embody corporate values and encourage employees to identify themselves in them. They organize different activities to involve employees and make them feel part of the organization, such as anonymous

questionaries about the betterment of the company or funny but relevant initiatives. Then, they share opinions in periodic focus groups or meetings and they establish an action plan.

*First proposals of solution*

At first, Fre Tor started to search young talents from Technical Schools and universities. However, as we have seen, suitable competences are not so easy to find.

Fre Tor started to operate through some parallel channels:

- In order to satisfy immediate and extraordinary demand, it signs contracts with specialized suppliers. With employees, they become part of the team for the realization of the order. Specialized operators are chosen after an evaluation of some criteria: certification of attendance to safety courses and to technical training courses. The contract is stipulated as "contract for the supply of services" for mechanical or electrical assembly, design, software. Inside the contract, it is defined how much material it is needed, if it is owned by suppliers or on loan. Before they intervene, Fre Tor requests all the necessary documentation for the start and the correctness of the operations.
- On parallel, it continues the search of young people, through partnerships with Universities, Confindustria, Technical Schools of Udine, Pordenone, Belluno, Treviso areas. They search them also through LinkedIn, recruitment agencies and Certottica (for participant to courses of formation). Young students are a great source of value for the company, since they have mental elasticity and freedom form paradigms; however, they need a long training course. As a result, Fre Tor needs long-term guarantees of work.
- In extreme cases, the company search active operators directly from competitors. However, it prefers not to do so.

Government formation plan has not considered completely companies' request for high-skilled technicians. In fact, it has not directed students to the choice of technical schools instead of high schools. Jury De Col has decided to partner with Confindustria to create eyewear field at Belluno technical school.

As we know, all these actions and other strategic decisions (ex. opening of the new plant) only partially solved the problem of competences.

In order to continue to act for this purpose, Fre Tor decided to increase investments in human capital search and formation.

- In order to attract talents, it started to organize expositions at schools and technological pole, and to offer students opportunities for internship and special paths, to which formation will follow.

- Formation path is built for the student and with the student, according to initial competences and final aspirations. It has specific dates that permit to meet objectives stated. Formation plan is built along years, with many contents in terms of quality and quantity.

- Fre Tor cares a lot about formation of employees, because new workers need to understand what the company's values are and the importance of experience in the inside Fre Tor. In order to know how to create machines and satisfy the client, they need to know all past experiences of Fre Tor. In this regard, the company is investing in a new management system that will permit flow of values and experience to be shared inside the company. We will see it later.

- To persuade new generations to enter and remain inside the company, Fre Tor focuses actions on mixing hard and soft skills, offering the possibility to have direct experiences of their future operations and to perceive what stands for "satisfaction of the client through passion and dedication".

A big opportunity for the resolution of the problem comes from the entrance in the group: the President, Barel, is creating a strong network with enterprises to collaborate for innovation. Fre Tor can be part of the network and share

competences. For example, the work of Additive Manufacturing was done thanks to a collaboration inside it.

Innovation in Fre Tor has now to change. At first it was generated by clients (Luxottica permitted Fre Tor machines to acquire an identity – *"I have a Fre Tor inside my company"*). After the entrance in the group, innovation started to be promoted by collaboration with other enterprises in the network.

Unfortunately, there are big **problems of internal and external communication**, that constitute an obstacle to find a concrete solution to the problem of competences: the company is not able to attract and maintain qualified personnel because it is not able to communicate what is its real brand identity, both to the outside and the inside.

At this proposal, they started a project of renewing of the actual management system. The new one, Lyra, will make clarity at the "core" level, solve the "heart" of the corporate problems and enlarge the possibilities to find solutions to the problem of competences.

The process of **introduction of a new management system** will be discussed later.

*Values*

As we all know, Fre Tor fight for values is what has always permitted the climb to success.

In general, with the start of the collaboration with Brovedani, the values seem to be shared with the group, but there are some peculiarities that need to be adapted.

In fact, when two companies decide to collaborate, what permits the success is the alignment but maintenance of differences that characterize each identity: only doing that, they could be able to learn from the other and to share competences to better satisfy the client.

Brovedani and Fre Tor decided to maintain the same "titles" but to give different interpretations:

|  | Work Together | Partnership | Personal Growth | Always Improve | Quality Workplace |
|---|---|---|---|---|---|
| **Brovedani** | We work together sharing trust and reliability, committing ourselves and encouraging everyone to invest their best capacities in the interest of the others. | In Brovedani we anticipate the needs of people, market and organization, through active listening, continuous betterment and technological innovation. | In Brovedani we search and recognize the value of each of us and we create the place in which, with courage and commitment, everyone can develop their skills. | We want to standardize, improve and innovate with method, experience and openness, ready to upset the obsolete. | Respect for the environment, well-being of people and ethics are essential aspects of the Brovedani's social responsibility, that contribute to make it a safe and serene workplace. |
| **Fre Tor** | Everyone's concern is that the work should be clear, full and easy to manage by the receiving colleague, facilitating everyone's work. | We are constantly interested to forge long-term collaborations with research structures and suppliers able to help us to express our mission in a differentiated way: to create value for our clients through the reduction of production time and costs; selection criteria of our partnership have to be future-oriented. | Each of us encourage and help the colleagues to invest their best capacities in the vision of client satisfaction and we interact with the "best" clients in terms of multi-channel. | We think that experience is a distinctive value and that through the error handling we can improve. The error needs to be underlined so that the solution adopted does not make it repeat. | We are sure that the pleasure to work in Fre Tor means satisfaction of the client. The well-being of the partner goes through listening of personal needs, project sharing, understanding and reciprocal support in the difficulties. |

What Fre Tor and Brovedani have in common is the extreme precision of their work: they realize products with millesimal tolerances. A little deviation could determine the success or unsuccess and define a product "well-done" or scrap.

In Brovedani, precision means respect of every standard imposed to machines and careful control of each piece. I would like to attach an image that is considered like the first description that Brovedani gives to clients when they ask for explanation of precision. They work with the tenth part of the micron; not only smaller than a hair, but also than a smoke particle.



In Fre Tor precision is, of course, careful control and respect of every detail, but it is intended to "come first" to the precision in the sense of Brovedani. Without a perfect work of Fre Tor in constructing machines, perfect pieces cannot be produced.

Each one of the values is client-oriented: the betterment of humans is intended to be in relation to the increase of the satisfaction of the client.

However, lack of suitable personnel and organizational difficulties have started to cause difficulties for the effective defense of values and client satisfaction, and values sharing inside Fre Tor.

The company recognized that, if organizational and "identity" problems were not solved, respect of values was impossible.

In fact, it has started to take some action that are discussed later.

*Communication for the outside and brand identity*

Now that the company has clients from all over the World, it cannot have an image of "family company" and needs to acquire a "global identity". For this reason, Fre Tor started to collaborate with an agency providing digital solutions. The aim of the project was the "Development of a web strategy to increase notoriety and reputation, become a good teller of products and services and increase contacts". Fre Tor started to use social networks like LinkedIn, Blog, Newsletter.

In addition, an important project that is increasing Fre Tor reputation and brand identity is **"Re-Think"**, that is the actual payoff. What they want to communicate is that the strength of the company is to help the client to change the perspective, to make it question and rethink the processes. The client will realize that processes could have a great potential of betterment and efficiency increase.

The success of the project require:
- A great understanding of the unique situation of each client, with some meetings
- Flexibility of the client to understand where the processes could improve
- Relationship of trust between the client and Fre Tor, that will try to tailor a solution for him
- Be able to use for each client the complex and different technologies.

An important step for the resolution of this problem is then made with the renewal of the management system.

*Internal communication and coordination*

With the increase in the number of employees and the complexities of orders and lack of personnel with the same values, internal coordination has manifested some signs of breakdown. It is everyday more and more difficult to maintain a good communication, and there are large consequences for the success of the company: costs sheets risk to be miscalculated and satisfaction of the client not to be realized.

The company realized that this problem could be solved by making a change at the "software" level: a reform of the internal management system. Internal communication is, in fact, made worse by the actual management system.
Joining Brovedani Group, it became necessary to unify the management system, and Fre Tor started to use SAP.

*Management system*

Fre Tor tried to integrate SAP (System Application and Product in data processing), but it found difficulties: SAP is suitable for a company like Brovedani, with high volumes for the same piece, produced through the use of the same machineries (ex. multispindle lathes) and monitoring the variability of prices of raw materials. Brovedani needs to keep track of long-term contracts with clients and suppliers. What is very important, for Brovedani, is to be able to contain the variability of costs to guarantee and respect the proposed price and the margin.
On the contrary, Fre Tor makes contracts with clients and suppliers for single orders.
In addition, Brovedani's organization is characterized by many workers and employees that perform few and similar actions; Fre Tor is characterized by a lot of "managers" that are responsible for consultancy, avamprogetto, co-design with the client, and few workers that physically realize single orders.

Therefore, characteristics and amount of information to be inserted in SAP is different for the two companies.

The integration between SAP and the old management system of Fre Tor does not perfectly happens: only part of the personnel (commercial office and avamprogetto) starts to use SAP, while part has not the access yet and continues to work with the old one.

Large part of the flow of information is exchanged by email or internal phone calls, that are essential to guarantee the respect of orders, but it is difficult to keep track of them.

To make clear understanding of how information flow is in Fre Tor, I would like to describe the process.

When a request arrives, it becomes necessary to correctly archive all information; a budgetary proposal is formulated with layout, then the offer is decided on the basis of shared opinion of the commercial office and internal managers (design, software, mechanics, electrics, assembly, production). In addition, an alignment with previous offerings to the same or to another client is required.

Exchange of information has to be done mainly through email or phone calls, then old offers have to be searched inside the old management system.

Difficulties of integration of systems do not permit a suitable exchange of information between different corporate departments. Consequently, efficiency of the company and respect of orders are at risk.

The **solution** identified by Fre Tor is to invest on the implementation of a new management system, Lyra, that will enable a correct flow of information and archiving of them. The new system will allow an exchange of knowledge and competences between different generations: for example, budgeting methods will be archived, and they will remain as a "public good" for future generations.

What Fre Tor consider of greatest importance is to keep track of the phasis of consultancy and avamprogetto, with all the details of meeting with clients, technical pre-analysis, test.

In addition, Fre Tor strongly believes in the value of the Fre Tor Book, indispensable to keep track of old automations. The book will contribute to exchange the knowledge about offering, budgeting, design.

Lyra can be personalized on the basis of the requests of the company, in fact Fre Tor makes focus groups to understand which data to put in the inside, to mix values and efficiency, and satisfy the client for time, costs and quality of the offering.

Fre Tor decides to keep track of information in this way:

| ORIGIN OF THE CONTACT | CONTACT ANALYSIS | PHONE CALL | VISIT | REQUEST | PRODUCT ANALYSIS | RISK ANALYSIS | SOLUTION PROPOSAL | ORDER |
|---|---|---|---|---|---|---|---|---|
| Exhibition | Company report (online) | Close of the contact | Generation of the need of the client | 1.New: experience, know-how and Fre Tor Book are important | Suppliers' contact | Adequate risk communication to the client | Layout | Preparation of documentation for the opening of the internal order. Attach: |
| Web | Economic reliability | Visit | Recognition of the problem through questions | 2.Specific need | Suppliers offers archive | Benefits | Cost sheet | Cost sheet |
| Supplier | Creditworthiness | Information exchange | | 3.Replica | Document archive of images and evaluations | Comparison with competitors | Offer | Offer |
| Salespeople research | Client Profile (sector, n°employees, turnover, role, decision-making power, clients, email) | Marketing action | | | Test | | Reviews | Client order |
| Word of mouth | | | | | | | Discount | Personal data |
| Other contact | | | | | | | Forecast of the billing date and operation field | |
| | | ALERT | | | | | ALERT | |

The system will allow the archiving of email, images, samples, with codes, characteristics, critical issues. In addition, what is important is to rapidly value the time between one and another phase

What Fre Tor needs is to keep track of:

- Contacts' archive
- Contacts' status
- Payments' status
- Analysis
- Considerations
- Revisions
- Test
- Open orders
- Turnover per client
- SAP interface
- Offers' configurator
- Service.

In this way, Fre Tor will be able to keep track of relations with the client. Establishing a precise way to make the client sheet will allow the company to align salespeople in maintaining a homogeneous relationship with the client.

The new management system will be fundamental for a successful meeting with the client, since Fre Tor will be able to understand and "put on paper" client expectations. Through the image of an organized and structured company, Fre Tor will obtain trust.

It will allow the company to effectively position itself on a certain market and achieve the competitive advantage.

In this way, Fre Tor will be able to maintain the reputation and brand identity, and confirm the values.

In addition, Fre Tor will be able to make a step to solve the **problem of lack of competence**, since:

- It will translate into "words" the experience contained in the Fre Tor Book and it will make it available to everyone, especially to new entrants.

- It will attract more and more young talents, thanks to the strengthened brand identity, but also to the larger possibility to "put on the paper" traditional values and to make them more understandable by the candidates. These latter will have the possibility to better understand company's requests.

- Information will be shared more easily inside the company, making new employees more comfortable to operate. In fact, one of the major motivations of a candidate when deciding not to work for Fre Tor is the uncertainty of the orders and future tasks. They will know faster and easier what type of task they have to perform, and to which type of "experience" it corresponds.

*Final considerations about the problem of lack of competence*

Partnerships with universities, long-term investments in formation and renewal of the management system, are only steps towards the resolution of the problem: in order to effectively solve it, Fre Tor needs a higher degree of collaboration first in the inside, between the top management and other levels, and also in the outside, with all the stakeholders that are present in the network created by Sergio Barel.

Finally, software of Business Intelligence and Corporate Performance Management could help the top management to strategically use data.

Only after these additional steps, the company will be able to effectively understand corporate needs, project them in the market, communicate the identity, attract talents. It will find a mix of "hard" and "soft" components, each one enormously important for the success of the organization.

**Fre Tor as the Factory of the Future**


*What is a "Factory of the Future"?*

What companies really need to do, if they want to be innovative, but at the same time to maintain the best workers inside the organization?

That's what we call: being the "Factory of The Future".

The core value of the new Factory is the integration between humans and machines, that is intended not as a "static" or "mechanic" relationship in which workers use and direct machines only as instruments. The main direction in which innovation should go is not only technological innovation, but also "social". The cooperation between humans and machines should be "smart". In the new Factory, workers are at the core, and their interests and beliefs are valued. There will be a new "culture of work" (Magone, Mazali, 2017). New workers will be asked to "do more and better", in terms of managing complexities and developing problem solving, communication abilities, team working.


Let's try to summarize a recipe for the Factory of the Future:

- **Integrate experience and innovation.** How?

  Some years ago, when technologies didn't change so fast, experience of workers could be transmitted to young generations directly in the workplace, through training and practice. Nowadays, companies want to rapidly find the "perfect talent": the worker that know how to use innovative technologies. Formation needs to prepare workers in three months. At the same time, however, experience of old workers is at the risk of being lost. In the Factory of the Future, once a worker has left the company, his experience remains inside, and it is part of the "public good" (Becattini, 1990), because workers give it to machines, that become a means of transmission. New software is developed on the basis of experience of workers, so the knowledge is no more of only one individual, but of all the organizational environment. In this way, companies can hire young talents even when they have "no experience". What is more

important, is their "multi-tasking" capacity, and their speed of learning; even though they have no experience with one particular machine, they could enter in multiple processes that include multiple machines.

- **Digital alphabetization is a prerequisite.**

  Basic digital skills are fundamental to be familiar with machines, regardless of tasks to be performed. To make an example, digital skills are important to permit the transmission of experience from workers to machines: employees can know what to do by consulting a tablet.

- **Standardize processes, but in a new way.**

  Standardization can not only be considered as setting up machines with the right sequence of operations, to avoid losing some procedures or generating scraps. It should be intended also as building a repository of good practices to guarantee reproducibility of procedures (Magone, Mazali, 2017). Machines should translate knowledge into information that are reproducible and replicable, necessary for humans' coordination.

- **Implement new technologies using critical thinking.**

  This point is connected with the previous one, since a new technology is useful when it does not replicate existent projects, but enable the use of less quantity of materials and hours of work, and make workers think about new and more effective solutions to problems.

- **Perform an open research.**

  Research and Development processes could not be limited to the internal, designated laboratories of the company, but they should involve engineers and researchers of all divisions, both inside and outside the company, by collaborating with other firms, research centers, laboratories, universities. In addition, innovation should come from the market: by monitoring changes in customer's preferences, organizations could become able to create something disruptive. Also in this case, digital alphabetization turns out to be fundamental since, for example, precious information about clients could be extrapolated from the internet.

- **Choose the right type of collaboration.**

  Not all collaborations create knowledge sharing, like transaction-based partnership cooperation, that are driven only by economic affairs. Other collaborations, like knowledge networks are more appropriate for increasing knowledge among partners and increase the value of human capital.

- **Invest in internal HRM** (Human Resource Management capabilities).

  Human resources and human development need to be seen through a strategic approach; intellectual capital needs to be managed in all its components, to create value: human and organizational capital oriented towards inside the organization, relational capital oriented outside, towards partners and customers (Stachovà, Papula, Stacho, Kohnová, 2019).

  Consequently, not only internal departments, but also the entire community of stakeholders are involved in the "open" process of innovation.

- **Motivate employees to increase company's performance.**

  This point is connected to the previous one, since HRM needs also to be oriented towards worker's motivation, satisfaction and engagement, upon which largely depends company's ability to create value.

- **Defend the strongest principles of the company and its workers.**

  A company has always some beliefs and values that need to be maintained to have success. Those values create the identity and if they are lost, the reputation of the company is at risk. They consist of a kind of guarantee for the client and suppliers.

- **Coordinate different solutions to enable worker's formation.**

  The above-mentioned initiatives to increase capabilities of employees should be implemented like in a cluster, in order to give workers a 360° degrees formation. Not only to focus on hard or soft skills, but on a perfect combination of them. In the Factory of the Future, workers have the complex task to interpret machines, and to recognize some imperfections

of processes; they need a "real-time" reactivity to rapidly find betterments.

*«It is something more than a conscious participation, it calls into question social identity of workers and finds reflection into incentives to transfer into work not only competence or attention but also passion»* (Magone, Mazali, 2017).

- **Use appropriate employee training methods.**

   The effectiveness of employees' education depends also on the use of right methods, according to the needs and structure of the organization. For example, some companies can choose to rely on seminars or videoconferences, and others on self-education or project works.

The new Factory is composed by workers that are involved in a process of continuous formation about how to increase their own abilities, how to innovate in terms of technologies and how to be constantly prepared to interact with machines.

It is not true that new machines are stealing competences to workers: they are requiring better skills and, once employees have become able to interact with them, they diffuse abilities to others and create continuity inside the organization's process of innovation.

Technological innovation becomes driver of cultural innovation.

The Factory of the Future is able to make the workers an asset to capitalize, and their formation a driver of the added value.

Technological capital is evolving at an increasing speed today: human capital has to follow it and to be ready to evolve with it.

*Could Fre Tor be considered as a "Factory of The Future"?*

Why did I choose Fre Tor as a demonstration of the possibility to create a "Factory of The Future" through organizational changes?

Fre Tor is passing through important changes. Its fight for values is guaranteeing the success.

After having described all organizational changes and implications, considerations about why Fre Tor as a Factory of The Future come by themselves.

First of all, Fre Tor considers machines as a "plus" in the life of workers and clients, that become able to perform better and produce more in terms of quality and quantity. They don't make the work of physical operators obsolete, but they add to them value, and they increase the company's competitive advantage.

Secondly, Fre Tor focused on improving internal communication as a method to solve organizational issues: The Factory of the Future, instead of changing methods of production or other "cool" aspects, it acts at the heart of the problem. Fre Tor is able to understand tacit knowledge of clients about their work, and to translate it inside a machine. A more complicated challenge is to transform the company's tacit knowledge about offerings, the one given by experience, in an archive that will permit everyone to use it. For this reason, it focused on the new management system.

Fre Tor decided to improve internal communication to increase the competitive advantage; positive consequences will be on all the aspects analyzed. In fact, by improving internal communication, people will share values and views and will be more aligned on their work. They will perform better, and the reputation of the company will increase. The company will be able to communicate historical beliefs and strengthen the brand identity. Then, it will be able to attract better employees and give them possibilities of formation and share with them the values.

Thirdly, Fre Tor maintained the focus on internal principles. Since the foundation, it was used to put the client at the center and to create around him all the offering. With the growth and organizational changes, Fre Tor continued to act in the same way.

The most important thing, when hiring new people, is to make them perceive that the work is done FOR the client and WITH the client, and because of that, the operator cannot consider an automation equal than another one.

With all these "core" solutions, Fre Tor can make clarity about the problem of competences.

More in general, we can say that in this company we have a demonstration of all the points mentioned above as the description of the "typical" Factory of the Future. There will be the perfect mix between hard and soft skills.

*What Italian SMEs can learn from Fre Tor*
Fre Tor is a company that started to use Industry 4.0 tools very after the majority of Italian SMEs.

Experience of Fre Tor could be taken as an example for companies struggling to find competences and to implement the use of industry 4.0 technologies.

It decided to solve the problem of competences through internationalization and global growth. It is only one of the many attempts SMEs can do. It is not that action of Fre Tor that Italian companies need to take as an example; in fact, the decision did not create immediate benefits, but it added organizational problems, to which new strategic decisions followed.

SMEs should build their own methods, those that are most suitable for the structure of the company and the market in which they are inserted in.

What they should learn is to have the right attitude toward the clients and the problems.

Everything is possible: what they need is perseverance.

It all started from the passion of a man: a common characteristic of Italian manufacturing small-medium enterprises.

**Why we cannot say that the problem of competences has been solved by Fre Tor**

We do not know if things will be better from now on for Fre Tor. We will keep track of indexes over the next months, and we will control the problem of competences. Today it is too early to measure the effectiveness of decisions.

Actions that a company does "per se" are maybe not so effective in solving the problem of competences because, as we saw, it depends on institutional issues. National coordination between schools, competence centers, hub, universities, companies, is weak. Government, at this moment, is only offering fiscal incentives to promote the introduction of industry 4.0 tools, but at the same time it is not promoting the formation of students that would use those tools.

As a result, we have companies that, despite recognizing the importance of implementing 4.0 technologies, are reluctant to do so.

# VI. Conclusion

Especially after Covid-19 pandemic, people demand long-lasting products. For them, quality is more important than in recent years.

Personalization and quality of production are two common elements to Industry 4.0 and Made in Italy, and with "Made in Italy" we are not referring only to the traditional sectors (Food, Fashion, Furniture, Automotive), but also to high-tech products (Micelli, 2016).

Personalization could permit companies to be competitive not only in national markets, but also in foreign ones, and the application of I4.0 technologies could permit them to economize on prototypes, suppliers and modify processes without additional costs and time.

Industry 4.0 tools are a precious asset in which SMEs should invest to become "Smart Factories" and create quality products. They should integrate artisanal competences with efficiency and productivity of machines.

*«Designers with digital competences […] Competences of young people that come from universities with artisans of great talents. This is the new mix of knowledge.»*
(Micelli, 2016)

SMEs can not only replicate Industry 4.0 model of foreign big corporations to increase competitiveness and be successful: on the contrary, they should create an "Italian way to industry 4.0" (Bettiol, Di Maria, Capestro, 2018), based on niche specialization using tools, machines, workers.

Fre Tor srl is a company strongly inserted in the industry 4.0 panorama: through the combination of craftmanship and superior technologies, it created the recipe for success. Fre Tor heavily believed in few but important principles, never betraying them, not even when difficulties put it to the test. That was the most rewarding thing. Fre Tor dedication for the client constitutes the distinctive

element of the company, a recognition factor that is leading it, step by step, to international success.

When it recognized lack of competences for industry 4.0, it tried to solve the problem through organizational changes and internationalization. However, it found only a partial solution, with additional difficulties. Despite that, Fre Tor fight for values permitted the company to remain solid, connect problems in a single line and find alternative solutions.

In Fre Tor we have a demonstration that industry 4.0 does not steal men's work, but ennobles him; it gives additional value to operator's abilities and together they create advantages for the company. Without men's passion and beliefs, but also technical competences, machines are only an empty skeleton; at this point, men recognize the potential inside the tools and animate them with their experiences, knowledge, capabilities. Only after this step, the company is able to understand complexities and translate them into simplicity and efficiency.

For some reasons I believe for the moment, any company can represent the perfect example to bring solution to the problem of competences.

Fre Tor took one of the infinite possible ways each organization can take.

Few steps have been done; in a while we will be able to measure the results. What is important to point out is the fact that without a larger coordination with all stakeholders and a long-term vision, it is difficult to solve the problem of competences.

I decided to conclude this work with Fre Tor case study because I believe it could represent the case of a company that with passion and dedication, typical of the heart of Italian craftmanship, was able to understand difficulties and find solutions, not only to personal problems, but also to clients' ones.

With these words, I am not saying that Italian manufacturing enterprises should start a business like the one of Fre Tor; the company, with its work, goes beyond traditional borders. What they need to do is to start to think like Fre Tor when performing in the markets.

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