IASP International Association of Science Parks and Areas of Innovation

35th IASP World Conference
on Science Parks and Areas of Innovation 2018
Isfahan, Iran

Polo Meccatronica: Where The Smart Factory Grows

Parallel session 5:

New roles and opportunities for STPs in cities, regions and AOIs

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Hosted by:

ISFAHAN
SCIENCE & TECHNOLOGY TOWN
(ISTT)

ISBN: 978-84-09-17612-0

Executive Summary

The Mechatronics Hub located in Rovereto (officially “Polo Meccatronica”) is a technological centre realized from the ashes of the Pirelli Cotton Mill, where business, innovation and education interact to generate and develop innovative projects. It is promoted by the Autonomous Province of Trento and involves key players from the public and private sectors and trade associations, offering a common space to produce, research and experiment innovative and more efficient products and processes.
According to the Quadruple Helix Model, government, industry, academia and civil participants work together to co-create the future and drive structural changes far beyond the scope of what any one organization or person could do alone. A model that encompasses user-oriented innovation models to take full advantage of ideas' cross-fertilisation leading to experimentation and prototyping in real world setting.

POLO MECCATRONICA: WHERE THE SMART FACTORY GROWS

From the Pirelli Cotton Mill to the first Business Innovation Center in Italy and Europe

Polo Meccatronica rises on an historic industrial site in Rovereto, the first manufacturing town in Trentino for history and tradition. It is built on the ashes of a cotton mill that began its activity in 1925 under the name of “Filatura di Rovereto”, a company owned by Pirelli. The cotton produced in Rovereto was used in the Lainate plant located in Milan. Since 1942 it has been definitively incorporated into the Pirelli group and, in parallel with Rovereto, the weaving part has also developed.

From this plant, which worked mainly high-resistance American cotton (but also Egyptian cotton), came out 11,000 kilos of yarn a day, about 3 million kilos a year (equivalent to 2 thousand times around the world at the equator or half of the distance between the Earth and the Sun).

The cotton produced by Pirelli in Rovereto was used in the tires and in the belts of the cars, but also in the soles of the Superga shoes, in the Arona raincoats or in the Linoleum floors.

On 18 March 1982, Pirelli closed the Rovereto plant leaving 250 workers, mostly women, at home. In April 1983, the former Pirelli Factory was purchased by Tecnofin Trentina, the progenitor of Trentino Sviluppo, a company owned by the Province of Trento and a group of seven local banks.

Starting from 1986 it was transformed it into one of the first Business Innovation Centers (B.I.C.) in Italy and Europe, a recognition that the European Union formally granted in 1992.

Nowadays, Trentino Sviluppo, as the local development agency supporting new entrepreneurial and innovative projects, manages six technological centres, hosting enterprises, research centres, and accelerators.

Among them, Polo Meccatronica is the thematic hub focused on mechatronics, a synergic interaction among a wide range of disciplines such as mechanics, electronics, information technology, hydraulics, pneumatics and sensoristics.

A unique hub for industrial production, research and education

Polo Meccatronica is a technological infrastructure, where business, innovation and education interact to generate and develop innovative projects with the support of Trentino Sviluppo. It is promoted by the Autonomous Province of Trento, and involves key players from the public and private sectors and trade associations, offering a common space to produce, research and experiment innovative and more efficient products and processes. Thanks to the interaction between computer science, electronics and mechanics, Polo Meccatronica defines itself as one of the few examples of innovative hub in Italy, where entrepreneurs, researchers and students can grow together by sharing a stimulating habitat.

In Rovereto, on an area of 10 hectares, this technological centre creates synergies that facilitate the development of collaborative research projects, in order to create innovative products and processes, transferring skills (and staffing) from the world of education and research to companies. A bet on which the Autonomous Province of Trento has invested around 90 million euros.

In Trentino about 800 companies operate in the mechanical-mechatronics sector, for a total of 10,000 employees. A cluster that sees in particular the presence of companies qualified in automotive, intelligent and robotic systems, sensors and industrial automation. The project of Polo Meccatronica is part of the Intelligent Specialization Strategy defined by the Autonomous Province of Trento, where Mechatronics (together with Energy and Environment, Agrifood, and Quality of Life) has been identified as a priority development area.

Started in 2013, Polo Meccatronica already hosts thirty companies and a total of 236 employees, with a turnover of 37 million. The first company moving in was Bonfiglioli Mechatronic Research, a research centre founded by an out-of-Region multinational company, that in Rovereto creates the next-generation reduced-speed gearboxes (TQs). Other companies that work within Polo Meccatronica are Carl Zeiss, a specialist in the design of precision optical systems, and the Ducati Energia Research Centre, which has built the prototypes of four-wheel electric vehicles and the first bike with an integrated electric motor inside the wheel. Since September 2015, the Dana Mechatronic Technology Centre, the first mechatronics-based Dana research centre in the world, has been specializing in advanced traction systems for off-road vehicles. The first centre of innovation worldwide initiated by the US multinational WATTS Water Technologies arrived at Polo Meccatronica in 2016. Among the most significant names there is also Nplus, part of the Aermec Group. A variety of interesting startups working on sensory, robotics, software and applied technologies complete this painting, together with Industrio Ventures, the first hardware accelerator in Italy.

Polo Meccatronica offers interesting opportunities both in starting a business, through the Starter program, and in consolidating it, through the Innovation Factory program. The setting-up offer is structured to accommodate different types of enterprises, from services to light and heavy manufacturing, and is designed to accommodate a plurality of organisational forms and sizes.

Every enterprise that settles in Polo Meccatronica is accompanied by a tutor who believes in its potential, follows its evolution, and provides support in order to promote its development and meet its consolidation needs. When enterprises ask for help in specific areas, tutors can also resort to a wide partnership network of national consultants and investors.

A productive site with a green hearth

Polo Meccatronica is built according to the Leed and Arca protocols, the first industrial reality to achieve such a high level both in the certification of environmental sustainability and in terms of performance and quality of the wooden structure. Receiving these certifications made it necessary to use high-quality materials thermal and acoustic characteristics as well as the construction of five wooden buildings with X-Lam prefabricated panels. It is the largest wooden cant ever built in Trentino.

All in the name of sustainability. From an elaboration realized by the researchers of CNR-Ivalsa[1] it has been calculated that the 2,100 cubic meters of "standing" lumber used to realize the structural part of the building correspond to the quantity of wood that grows in the Trentino woods in 18 hours and 36 minutes.

In other words, in less than a day the Trentino forests produce in a completely natural and sustainable way the whole amount of wood necessary to build the entire wooden cant.

[1] Institute for the enhancement of wood and tree species

ProM Facility: The new rapid prototyping laboratory of Polo Meccatronica

ProM Facility is an open lab designed to produce, research and experiment innovative and more efficient products, combining traditional mechanics with the most modern sensors and sophisticated virtual prototyping systems and electronic control techniques. A result of the collaboration between the Autonomous Province of Trento, Trentino Sviluppo, Bruno Kessler Foundation, University of Trento and Confindustria Trento, the ProM Facility provides companies operating in the mechatronics sector with an integrated platform for the prototyping and qualification of mechatronic systems and subsystems.

This facility is a state-of-the-art infrastructure – unique in the Italian landscape. It brings together the skills provided by the Bruno Kessler Foundation and the University of Trento. Designed to respond to the incitements and requests from the local and national industry, through the support of students of technical schools, textiles and doctorates, it also wants to become a "nursery" of new technicians and engineers ready for the working life, in a modern context able to fit the global challenges of Industry 4.0.

The beginning of ProM Facility activities dates back to April 3, 2017, with the activation of the first machinery and the signature of the convention for the joint management of the laboratory by the promoters of the project. Yet, the public presentation of the ProM Facility was held on 29 and 30 June 2017, during a two-days event that saw guided tours, moments of in-depth study, a roundtable for the discussion of the more general topic of Smart Manufacturing and a scientific workshop focused on Additive Manufacturing.

The Facility, thanks to the commitment of European Regional Funds (ERDF), has innovative machines – 6 million euros worth – for rapid prototyping and three-dimensional printing of artefacts. Among ProM's flagships is an integrated machine tool that works simultaneously as a five-axis numerical milling machining centre and as an additive production system - by sintering and melting metal powders using a laser beam. A combined laser cutting machine for tubes and sheets of various materials is also included. There are also two 3D printers to create components by sintering or selective casting of metal and polymer powders using a laser beam, a 3D scanner, an electromagnetic lathe with numerical programming, as well as other specialist equipments. The Facility's offer is complemented by a specific focus on cyber security, an increasingly hot topic even in the industrial field.

Technical engineering staff moving in the mechanical and mechatronics sector can find upgrading and specialist training opportunities in a dynamic and next-gen context. Students and PhDs are offered high quality training courses and educational paths of excellence. Companies can get in touch with innovative technologies and find solutions with the help of researchers. At the same time, they will be able to target the professional skills that are ideal for their future needs and thus help define future generations of professionals tailored to their needs. For what concerns research, the expected result is the creation of a more effective link between business and training world. From the point of view of education, the goal is to create a new generation of "T-shaped" students ready to face the new technological challenges of entrepreneurship and to favour the professional occupation of students who have operationally learned the specific skills required by the labour market.

The aim of the project is to provide responses to the needs of the future manufacturing market, through the introduction of the so called "Top Technologies" of the future (Mechatronics, Internet of Things, Additive Manufacturing, Composite and Nanomanufacturing, Embedded Systems and more).

The operational management of ProM Facility is entrusted to a team of experts including a director, representing Trentino Sviluppo, a scientific manager, representing the University of Trento, a technical manager, representing FBK, a technical coordinator and three technologists. The laboratory staff is supported by high school students, graduates, and PhDs students, that have the opportunity to complete traineeships and research paths of excellence working on concrete projects. The University of Trento will grant two doctoral awards per year on topics related to Polo Meccatronica, whereas Confindustria Trento will fund a specific two-year research grant for related activities. Additional responsibilities for specific research projects can be made available by the partners. In particular, an FBK researcher will coordinate the activity focused on the ICT theme of industrial systems and IT security.

A technological hub in steady evolution

ProM Facility is linked to the overall design of the Polo Meccatronica Industrial Laboratories, a project that will be completed with the construction of the new building - about 6,000 square meters of laboratories and research centres. Temporarily placed in a production module of Polo Meccatronica, the ProM Facility will occupy approximately 1,000 square meters of the total 6,000,

while the remaining 5,000 square meters will be available to individual companies that can be hosted for shorter periods so to exploit the services and develop new industrial research projects in an environment prone to cross-fertilization and innovation - an open model inspired by European and American centres of excellence.

At the completion of the Masterplan elaborated by the Municipality of Rovereto, the new headquarters of the Technical Technological Institute "G. Marconi" and the Professional Training Centre "G. Veronesi" will also find their place in Polo Meccatronica.

The Professional Training Centre" G. Veronesi offers several training courses for qualification and for technical and matriculation diplomas in the following fields: electrical, mechanical, mechatronics, industrial automation, conduction-maintenance of automated systems, digital fabrication. Laboratories, cutting-edge equipment and school-work alternation allow an offer in line with the needs of the labor market.

Alongside the technological courses of "Electronics and Automation", "Mechanics", "Mechatronics and Energy", "Computer Science and Telecommunications", the Technical Technological Institute has activated a two-year post-diploma course of Higher Education for "Superior Technician for Automation and mechatronic systems" born to meet the demand of companies with new and high technical and technological skills.

The model of vocational training and secondary technical education applied in Trentino is able to quickly and flexibly support the technological needs of companies, thanks to the dual system that represents a "hinge" between school and work, where educational institutions and employers work together to build professionals suited to the needs of companies.

This is possible thanks to the fact that for an adequate number of students (at least one class) it is possible to "curve" the training path towards company needs also during the year.

From the point of view of the urban planning, the Masterplan promotes the integration between productive realities, educational establishments and research institutes with a careful look to the wider involvement of the surrounding urban fabric. Indeed, Polo Meccatronica will communicate with the rest of the city via a functional roadside system, sleek connections, an efficient public transport system, where there will be many different green spaces open to the community (park, boulevard, etc.).

The hypothesis of the first national "test-site" for self-driving vehicles

There is the hypothesis to realize the first national "test-site" that will simulate an urban environment to test the cars of the future, based on the applications of connected and cooperative systems. A ring road with the intersection of two other paved roads in the middle. Around the roadway the reconstruction of an urban environment: houses and buildings, traffic lights, signs, pedestrians ready to cross, trees. In this "fake city", Fiat Chrysler Automobiles will test the car of the future, increasingly interconnected, that tomorrow will drive itself.

The track, closed to traffic and adaptable to all the simulation needs, will serve to study and experiment advanced systems for preventive safety. Through the new generation of connectivity technologies, the cars and traffic control centers will be able to exchange information, increasing the safety margin of vehicles, with the aim of extending the ability of the vehicles to interpret the scenarios that occur continuously on the road. The aim is to produce thinking cars and smart roads with digital control to improve the safety of those behind the wheel. To do this, you need to sensorize and infrastructure highways and roads to put them in communication with the vehicle. The circuit will serve for representative tests of the urban scenario related to smart mobility on digital roads. In addition, the track was designed for the tests of the Formula "Sae -Society of Automotive Engineers", a competition between universities that involves the design and production of electric racing cars.

The location that will host the “test-site” is currently under evaluation and might be identified both inside or outside Polo Meccatronica, in order to choose the most adequate area on the regional territory.

A true research environment

In Trentino, the system of research and higher education, with its numerous public and private realities, identifies one of the strategic axes on which the exercise of provincial autonomy has been more developed. In the last forty years substantial investments in research and development in favour of public institutions, of the University, and aimed to facilitate investments by companies, have transformed the Province into a real "research and knowledge hub", which is also recognised internationally for the quality of the results achieved.

The Trentino region excels as an area with a strong will to invest in research and development, with investment levels around 1.9% of GDP (2014), well above the national average (1.31%) and in line with the European average (2%).

Among the main actors involved in the field of research and development there are the University of Trento, with approximately 16,000 students, over 600 professors and researchers divided among 10 departments, three University Centres, and seventy laboratories and spinoffs; the Bruno Kessler Foundation, with 400 researchers and twenty research centers, which are specialised in particular in the analysis of materials, the manufacture of micro-silicon devices, energy saving systems, and the creation of innovative information systems; the Edmund Mach Foundation, with 350 employees and a focus on agriculture, agrifood and environment; Trentino Innovation Hub (HIT), which cares on the promotion of research's results ensuring the technology transfer.

Impact of industrial operations concluded by Trentino Sviluppo

FBK-IRVAPP[2] conducted a prospective analysis to quantify the extent to which interventions implemented by Trentino Sviluppo in the industrial and tourist fields have been a stimulus for the provincial economy.

The impact of the Trentino Sviluppo interventions has been estimated with the Trentino Multisectoral Econometric Model (MEMT), fed by a database that reflects punctually the structure of the provincial economic accounts. With this model some simulations have been conducted, for the period 2016-2020. In other words, the value of GDP was estimated in 2016-2020 in the presence and absence of the amounts handled by Trentino Sviluppo. The difference between the two estimates is equivalent to the consistency of the effect of the amounts moved.

In the industrial field, Trentino Sviluppo has intervened through the following actions:

- Provision of real estate spaces acquired if necessary or already owned by Trentino Sviluppo, often through the establishment of companies in the Business Innovation Centers
- Purchase and subsequent leasing of technological systems
- Measures to prevent companies from defaulting

The contribution from Trentino Sviluppo generated gross sectoral fixed investments also by private individuals.

Against movements of € 11.2 million in 2016, an increase in the provincial GDP is estimated at € 13.8 million at the end of 2020. To give an account of how the sums handled by the Trentino Sviluppo's interventions are a stimulus for the local economy, it is necessary to translate the estimates presented in unitary terms.

TS investment	Total amounts moved	Cumulative effect on the provincial GDP after 5 years
81 cent	1 euro	1.23 euro

[2] The Institute for Evaluative Research on Public Policies of the Bruno Kessler Foundation is a research organization specialized in the analysis, conducted following a counterfactual view, of the effects of the measures taken by the Public Administration in order to change the living conditions or behaviour of some individuals (organizations, groups or persons) within the various spheres of society.

In general, it can be argued that the amounts moved should result in higher GDP over the next five years than the sums themselves. These estimates therefore testify that the interventions of Trentino Sviluppo can be read as a stimulating factor for the entire provincial economic system.

Now, what would have happened in the absence of Trentino Sviluppo's interventions in the industrial field? With a movement of - 0.75 million euro in 2016, a decrease in the provincial GDP is estimated at - 0.58 million euro at the end of 2020.