

GAP ANALYSIS

Deliverable D.T2.2.4

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This Gap Analysis has been carried out through the following steps:

- Swot Analysis that allows to describe the current state of Industry 4.0 in the Lombardy Region (D.T2.2.1): a snapshot of the efforts and strategic directions in the 4.0 area held by the national and regional public administration to date;
- Detection and analysis of the gaps obtained through the comparison between the Lombardy Region and the Ecosystem model 4.0 (ECOS4IN).

1) Our Ecosystem

Industry 4.0 so far today

2016 National Plan Industry 4.0

In this context of profound technological and digital change, in recent years in Italy several policy lines have followed one another, aroused in part by what was happening at European level, aimed at promoting and incentivizing the passage of the national entrepreneurial fabric to paradigm 4.0.

In September 2016, the Government presented the expected Industry 4.0 plan contained in the 2017 Budget Law, definitively approved on December 7, 2016. The plan was created with the aim of mobilizing additional private investments in 2017 for 10 billion, 11.3 billion of private expenditure on research, development and innovation with a focus on Industry 4.0 technologies, plus 2.6 billion euros for private early stage investments. The provision proposes a mix of tax incentives, support for venture capital, diffusion of ultra-broadband, training from schools to universities, with the ultimate aim of favoring and incentivising companies to adapt and fully adhere to the fourth industrial revolution.

The National Plan launched in 2016 provided for the creation of two new entities: the Digital Innovation Hubs (DIH) and the Competence Centers (CC).



The Digital Innovation Hubs, centers to be set up on the territory, in the number of 21 - like the total of the Regions and Autonomous Provinces - belonging to Confindustria and R.ETE. Italian companies, to help Italian SMEs in the transformation towards Industry 4.0. In addition, the Plan introduces CCs, realities that refer to some Italian universities, with the aim of intensifying relations between research and industry. Each CC has a different specialization.

DIHs represent a great opportunity for SMEs as they constitute the pole of technological innovation to support companies in the transition to the "Industry 4.0" paradigm; in detail, a DIH is specialized in all those that are conventionally considered as key enabling technologies, such as additive manufacturing, big data, analytics, cloud, cybersecurity, Internet of Things, augmented reality, robotics and simulation.

It goes without saying that the main requirement to which DIHs attempt to respond is that of contributing decisively to the stimulation of Industrialization 4.0, especially through the construction of a solid collaboration between research organizations and businesses. In summary, the DIHs should, on the one hand, represent the "glue" able to put in contact the various public and private actors who find themselves acting on the territory; on the other, accompanying the business network towards the fourth industrial revolution, offering SMEs the services they need and directing them to CC with specific skills.

More specifically, the multiple objectives that the DIH intend to achieve are summarized below:

- raising awareness among businesses on the opportunities arising from the Industry 4.0 phenomenon;
- concrete support in planning innovative investments;
- a subsequent referral to the CCs - which will be described shortly - through which they can provide a real mentoring service;
- last but not least, support for companies in obtaining public and private funding.



In order to be achieved, the objectives listed above naturally require the simultaneous involvement of numerous and different actors: Research Centers, Clusters, Local Authorities, Fablabs, Start-Up Incubators, Investors, Science and Technology Parks, Industrial Players and Universities.

If the DIHs represent the gateway for companies to Industry 4.0, thanks to the services offered for the introduction of the technologies, the CCs actually represent their driving force, being research and innovation poles closely linked to the universities, capable of provide top-level skills and professionalism on issues relating to paradigm 4.0.

In detail, the three main objectives that CCs set themselves are:

- support companies in assessing their level of digital maturity by developing and developing tools aimed at conducting ad hoc assessments;
- train company employees, promoting and spreading 4.0 skills, through training courses both in the classroom and directly on the production line;
- implement industrial research, innovation and experimental development projects.

The CC identified by the MISE following the selection procedure are eight; One of these is

- "Made in Italy 4.0" is led by the Milan Polytechnic;

In conclusion, the joint contribution of DIHs and CCs is to contribute to providing services to businesses that are key enabling factors for access to the new "digital ecosystem", responding to a two-fold need: physical instrumentation and know-how. They represent an important driving force in showing in the Fourth Industrial Revolution an enormous growth opportunity, capable of optimizing the productivity of the "factory of the future" and relaunching the country's economic growth. DIHs tend to be established with regional or interregional relevance.

2017 National Plan *Impresa 4.0*

In September 2017, the government presented the second phase of its industrial policy in favor of the transition to the 4.0 model.



2019 Transition 4.0 National Plan

The 2019 Budget Law contains the Transition 4.0 Plan, focused on innovation, green investments and design. The Plan defines the country's new industrial policy regarding the introduction of new digital technologies. Its actions translate into incentives and support measures for companies, in particular through tax credit for investments in capital goods, research and development, innovation and design, training 4.0.

As part of the National Business Plan 4.0, the 2019 Budget Law also provided for the creation of a **non-refundable contribution, in the form of a voucher**. The objective is to support the processes of technological and digital transformation of SMEs and business networks throughout the national territory through the introduction of managerial figures in the company capable of implementing the enabling technologies provided for in the Business Plan 4.0 and of modernizing the company's management and organizational structures, including access to financial and capital markets. The measure introduces a non-refundable contribution in the form of a voucher for the acquisition of professional skills to support companies that intend to invest in innovation and digital technologies. The facility is paid to SMEs, but also to the networks of companies that have hired managerial resources to encourage digitalization and corporate reorganization processes.

4.0 AND LOMBARDIA REGION

Lombardia has been the first Italian region that decided to tackle the theme of the fourth industrial revolution, regulating it through a law approved on April 10, 2015 entitled **Manufacture 4.0**, on the basis of the prerogatives entrusted to it by article 117 of the Constitution. The approach adopted by the Lombard legislator introduces important elements of novelty not so much from the point of view of the proposed intervention methods, but for the target of interest

The development of actions to support industry 4.0 should concern not only the traditional supply chains in the area but reach, without distinction of sector or supply chain, the largest number of companies in the region. Just as one of the cornerstones of the paradigm proposes greater integration of the company not only vertically but also horizontally (supply chain oriented), so its



adoption should not be limited to exclusive supply chains. Enabling technologies also offer flexible and adaptable solutions for the digitization of activities and sectors that are also very different from each other.

More than a paradigm adopted by a business niche, Industry 4.0 should be understood as a strategy to be adopted in a broad sense. In fact, its implementation should not be limited to involving production chains but, to encourage the integration that the paradigm proposes, it should expand beyond the borders of the chains themselves.

2) Needs in the Lombardia Region

According to ISTAT, the official Italian statistics provider, the plans mentioned above stimulated corporate digital investment. In 2017, tax incentives encouraged two thirds (67 per cent) of Italian companies to invest in new technologies and machinery. However, the impact was mostly in large companies – 96.7 per cent of those with more than 50 employees made fresh investments because of tax incentives. Among smaller companies, with fewer than 50 employees, only 42 per cent did so.

There is a need to **support SMEs in their innovation process** and acquisition of 4.0 technologies.

Moreover, the limitations of the Italian education system, in terms of **skills and training** related to advanced technologies, are another major concern. Italy's robotics industry has complained that there are not enough specialised professionals and technical experts. According to the Ministry of Economy and Finance, Italy is considerably below the European average as far as its workforce having digital competence 29 per cent, as compared to 37 per cent for Europe as a whole.

Participation in 4.0 training courses in Italy, at 8.3 per cent, is also well below the European average of 10.8 per cent. In this respect, Italy also ranks far behind France, at 18.8 per cent, and the United Kingdom, at 14.4 per cent. The gap is, unsurprisingly, even wider compared to digital

leaders such as Sweden, Denmark and Finland, where more than a quarter of the workforce is educated in aspects of digital technology



There is a need to intervene to direct the training and education system in order to encourage the development of skills in line with the professional needs of 4.0 companies.

2) Nice to have in Lombardia Region Ecosystem

ACTIONS	MACRO-OBJECTIVE
Pull and Open Innovation	Increase SMEs' implementation capabilities of innovation projects
New skills and competencies	Develop new skills 4.0

PULL AND OPEN INNOVATION FOR SMEs

Micro, small and medium-sized enterprises make up most of the businesses in Lombardy.

There is a need to **increase SMEs' implementation capabilities of innovation projects** (facilitating access to qualified resources, supporting not only the development of strategic plan but also their execution, increasing the financial sustainability of innovation projects and their access to financial resources) through the creation of **collaborative ecosystems** that will enable the adoption of Open Innovation (OI) in Lombardia manufacturing.

Within these ecosystems, all the main actors can potentially contribute to **the design, prototyping, validation and finally production of** innovative consumer good products and services.

Open Innovation (OI) is a concept that is widely discussed and promoted in the manufacturing domain since decades, with the potential of offering a breakthrough approach that discloses



opportunities for new ways of cooperation and business, with the aim of bringing into the market new products and services to beat competition or open new market niches.

In the traditional "closed" innovation model, organizations carry out research internally, however, this "closed" approach also implies a series of internal organisational and cultural barriers hinder the effective sharing of knowledge and information by reducing consequently, the collaboration and effectiveness of innovative output (eg Dougherty, 1992).

Similarly, financial barriers resulting from investment choices in facilities, research laboratories and internal intangible assets, and legal barriers, generated by a strenuous defense of intellectual property, may result in increased costs of innovative activities unaffordable for most of SMES. Finally, the closed innovation had an intrinsic "local" dimension, with no or very few exchanges across regional or national borders. But for the new competitive context characterized by requests for flexibility, customisation, rapid innovation cycles, dematerialization of products and services provide the ideal context for the adoption of the principles of OI as proposed by Chesbrough in 2003 First of all, it is necessary to "open" the R&D function, transforming it into an open system in which the sources of new knowledge are both inside and outside the organization. Part of the outflows of knowledge comes from Fablabs, Makerspaces and Hackerspace that are different types of fabrication workshops where digital equipment such as laser cutters and 3D-printers are offered to the public to create products on their own, usually promoting cooperation not only for sharing the tools, but also facilitating co-design, exchange of models etc...

Makerspaces in Lombardia Region represent the way Innovation can be achieved by SMEs in a quick, agile and cheap way. Innovation is implemented along a very "short" value chain, where users of new products are ideators, which provide specifications (and sometimes take part in the realisation) to makerspaces. The transfer to industrial SMEs companies of the Do It Yourself (DIY), fablabs, micro-factories and makers approaches can pioneer ways towards engineering solutions throughout the whole value chain. These innovative methods can lead to new processes, machines and products with new functionalities and shorter time to market.



The creation of very powerful synergies for OI between traditional manufacturers and FabLab/Makers/Research Labs requires a “innovation platforms “that supports the definition, adaptation and adoption of new processes and new cooperation methodologies to offer value to all of them, and to establish ways of involving other very relevant stakeholders, first of all customers, designers but also investors, and the society at large.

To fill the gap Lombardia Region could develop 3 main tools :

A Toolkit made of: **collaborative processes**, tailored on factors such as manufacturer domain, dimension, available assets, that explain manufacturers how to change the internal organisation, embed cooperation with customers, Makerspaces and equip itself with tangible and intangible assets to be involved into OI processes; innovation **methodologies** elaborated with the support of experts to engage many players and guide the co-creation and co-design, eliciting, needs, expectations and creativity from the ecosystem players.; new collaborative **business models** for the scaling to market of the innovative products

An **innovation platform (physical and virtual)** , where actors can meet and be supported in setting up a cooperation, collaboratively elaborate new ideas and share knowledge to make this idea a real product. The platform will offer services to collect, share and comment ideas, to identify companies and makerspaces with complementary competences to set-up partnerships targeting at innovative products and services, to exchange information on innovative ideas and/or production methods, to facilitate the transformation of an idea into a producible item, and making assessment on the feasibility and sustainability of a new idea and to offer interoperability solutions allowing retrieval, sharing, extension and evaluation of knowledge provided by different and heterogeneous sources

New Manufacturing Demonstration Facilities/Hubs (MDFs), where companies will test new technologies in cooperation with fablabs and makers in order to develop real industrial products and where training is offered.



SKILLS AND COMPETENCIES

The transformation processes seriously question consolidated paradigms and historical practices, therefore it is necessary - in a pro-active perspective - that they are accompanied by the introduction of technological innovation tools that allow to advance the skills of workers in companies, especially the small and medium-sized ones (SMEs). These represent the substantial part of the Lombardia industrial and tertiary base, but often do not have the relational, human and / or technical resources to join the networks of technological innovation as is the case for large companies involved in agglomerations of technological innovation (DIH, CC, Scientific Parks and Technological, Technopoles, etc.). They are therefore faced with more difficulties with new technological and digital changes, which, moreover, must be accompanied by effective strategies on the professional training side, in order to increase the skills of workers with a view to 4.0.

The birth of the Competence Centers and Digital Innovation Hubs, each of which responds to specific purposes, including training, introduces two new subjects into the regional education systems. In this way, the structure of the training chains on a regional basis registers a change that can potentially give rise to both the development of new and positive synergies and to harmful overlapping phenomena. In other words, the generation of a higher degree of complexity, given by the multiplication of the actors, can produce both the achievement of a higher level of collaboration and consultation, and a possible duplication and overlap of functions and interventions. This acquires particular importance, considering the fact that DIH and CC both deal, from different perspectives, with an increasingly strategic resource, connected to the development of skills and knowledge on 4.0 technologies. In fact, the new knowledge and skills increasingly requested and mobilized in companies will become central to meet the challenge of the transition to the digitalization of the business fabric. Several surveys conducted in recent years testify to the fact that a large part of Italian companies, even if the analysis is limited to the mechanical sector only, currently show significant delays in the introduction of digital (Beltrametti and Persico, 2016). This is a phenomenon that cannot fail to be duly considered when addressing the issue of training for new skills.



It should be stressed that the key resources in enterprise 4.0 are not limited solely to technical skills. Certainly the use of new technologies requires specific and distinctive know-how, the result of vertical study paths oriented towards an ever greater specialization of a technical nature. However, at the same time, the world of work 4.0 will increasingly require the ability to creatively use knowledge, applying it to new problems and devising unusual approaches for dealing with problems that are not yet definable today.

A second crucial element to be considered regards the fact that the professionalisms of the future will evolve into profiles structured for multi-skills, acquired in differentiated learning contexts (formal, non-formal, informal), with a large use of work-based learning and training. on-the job. Consequently, collaboration between companies belonging to different components of the training system (school, CFP, ITS, IFTS, University, business world, etc.) becomes a crucial factor.

A further aspect to be taken into serious consideration has to do with what emerges from the reflection of scholars and professionals on the development of the Industry 4.0 model. In fact, many insist on the fact that the transition to digital through the introduction of enabling technologies must be preceded - both logically and factually - by a redesign of companies in terms of corporate organization. This means that, in a scenario of transition to 4.0, there is not only the emergence of a request for skills that are not exclusively technical and a remodeling of profiles in a multi-competence sense. In addition, educational systems are stimulated by additional factors that require convergent action between multiple training agencies. In fact, the transformation of organizational models requires a similar rebalancing of professional culture by the different roles and functions. Also in this case, the promotion of skills in 4.0 logic in a widespread form implies a concerted action between training bodies and companies, operating in the light of a common intervention logic.



To summarize, the objectives to be set up are:

- reduce (and in perspective bridge) the skill gap between the needs of businesses with respect to the digitization processes and Enterprise 4.0 and the profiles leaving the school and university system
- inserting in the training system of higher skills the ability to adapt and update the offer system
- encourage and strengthen the level of post-diploma alternative technical higher education than the university channel, as a fundamental junction between training and needs of medium-small enterprises with high manufacturing tradition
- create a widespread culture, right from primary schooling, conducive to innovation and digitization as an opportunity for personal and social growth in a sustainable and cohesive perspective.



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