



Industry 4.0 for the future
of **manufacturing** in the EU

COUNTRY REPORT

Italy



FEDERMECCANICA

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Further information is available at <http://www.adapt.it/industry4EU/>

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1) Introduction

The EU manufacturing output stands for 15% of the overall member states' GDP and EU has declared that the goal is to increase this level by 20% by the year 2020. However, since 2008 over 3.4 million jobs have been lost in the metal industry. These data proves that a new phase of EU economic growth cannot come without the involvement of metal and mechanical industry. Industry 4.0 is a new production system resulting from the application of new technologies to manufacturing. Industry 4.0 represent a game changer affecting all the activities linked to manufacturing, from planning to processes, from products to work organisation. While the robotic evolution of production represents an opportunity for the EU economy, as it implies the demand for new professional figures, the process will involve several challenges for the EU labour market, including a loss of low qualified jobs and a lack of high-skilled workers (F. McCrory, Y. Alhammedi, G. Westerman, E. Brynjolfsson, *Racing With and Against the Machine: Changes in Occupational Skill Composition in an Era of Rapid Technological Advance*, 2014).

This report is part of INDUSTRY 4EU (Industry 4.0 for the future of manufacturing in the EU), a project aimed at bringing together social partners and institutions from Italy (ADAPT; FEDERMECCANICA), Germany (NORDBILDUNG), Slovenia (Chamber of Commerce and Industry of Slovenia) and at the European level (CEEMET) in an effort to identify concrete actions to cope with challenges and opportunities of Industry 4.0. Particularly, INDUSTRY 4EU is intended to identify good practices and possibilities for employers to successfully support the implementation of Industry 4.0, especially by the means of social dialogue at all levels, from firm to the European Union. According to the European Commission, one of the goals of the Europe 2020 strategy is “to promote the restructuring of sectors in difficulty towards future oriented activities, including through quick redeployment of skills to emerging high growth sectors and markets” (European Commission, *Europe 2020. European strategy for smart, sustainable and inclusive growth*, 2010), thus fostering the Renaissance of industry in Europe.

Even though Industry 4.0 has still not been tackled by a joint action within the framework of the European social dialogue, EU social partners are currently demonstrating an increasing interest in this topic. INDUSTRY4EU (Industry 4.0 for the future of manufacturing in the EU) wants to be a stepping stone to put Industry 4.0 on the top of the EU social dialogue agenda. The project is aimed at bringing together social partners and institutions in an effort to identify concrete actions to turn Industry 4.0 challenges into opportunities. The main objective is to improve dialogue between employers' associations in order to create conditions for the spread of Industry 4.0 in the European countries, thus contributing to reconverting present factories and helping them to be more competitive.

This national report is one of the outputs of the project, aimed to explore the current landscape of Industry 4.0 in Italy based on the results of a map of past and existing unilateral programmes, as well as social dialogue initiatives to deal with the skills mismatch arising from the digitalisation of production methods and developing the technical skills necessary for the implementation of Industry 4.0, a mapping exercise conducted by FEDERMECCANICA and semi-structured interviews conducted by ADAPT.

2) Objectives and methodology of analysis

The goal of this report is twofold. First to show the results of a mapping process in order to identify all the initiatives already under way about the issues involved in the process of transition to Industry 4.0 in relation to work and social dialogue. In fact one of the risks of the approach to future issues and scenarios is not to act as a broader system of all the actors involved in the change, in this way, however, is very difficult to build a sufficient critical mass to face the challenges of the transition. Besides that, often businesses and the social partners are not aware of the initiatives already in place and the potential opportunities and fundings related to them. The exercise of mapping exercise conducted and presented in this report wants to be a useful tool for all stakeholders of Italy to evolve their business models to the Industry paradigm 4.0. To this end we conducted a desk research by going to map all the institutional and social partners to sources involved in the innovation processes in Italy using websites, social media, institutional communication, institutional relationships.

The second objective of the survey is to map the level of business awareness both for the theme 4.0 Industry as a whole and in relation to the impacts on the labor market. For this reason we conducted a survey among companies partners of FEDERMECCANICA asking them several questions designed to frame the issue in terms of knowledge of technology, adoption of technologies, expected impact of them, and the forecasts of purchase and investment. Attention then focused in asking what are the impacts on the labor market, particularly with regard to the skills required by the new Industry 4.0 and the impact on work organization. The aim of the survey is to have a complete and representative landscape of the situation of enterprises in Italy in order to then develop good transition practices built on the principles of social dialogue.

3) Stakeholders' involvement

Federmeccanica¹ represents the Italian companies working in the metalworking sector (MET) towards Industrial Relations with a special focus on Labour Law issues in accordance with the three branch Trade Unions, namely Fim, Fiom and Uilm.

Federmeccanica leads almost 80 Local Industrial Associations and belongs to Confindustria, the association that represents the manufacture and service companies in Italy; at the same time, Fim, Fiom and Uilm belong to the Trade Union Confederations Cisl, Cgil and Uil, respectively.

Social Partners (Federmeccanica, Fim, Fiom and Uilm) are responsible for renewing the National Collective Agreement of Labour (NCAL), which defines the rules for metalworking companies and workers.

The NCAL disciplines the key items aimed at tackling the skills mismatch and settles special tools aimed at developing the required competences, such as the continuous vocational training, the workers' right to the education and the apprenticeship contract.

In particular, with the renewal of NCAL signed in November 2016, the Social Partners introduced a new individual right to continuous training accounting for 24 hours (on a 3-year base), in order to “update, improve or develop knowledge and professional skills linked to technological and organizational innovation of productive and working process”. The metalworking one is the first NCAL that introduces in Italy such right for workers, enabling both the employability and the enterprise competitiveness. The competences pointed out in this rule are digital, linguistic, soft or managerial. Furthermore, the Social Partners agreed upon the launching of a national campaign aimed at filling the digital skills gap.

The bilateral National Committee for vocational training and apprenticeship is responsible for: reaching an agreement upon sectoral multiregional training plans; monitoring the training initiatives; identifying companies' needs in terms of skills and coordinating the committees established at local and plant level. In firms with more than 300 workers, the plant level union structure could appoint the Vocational Training Responsible, who has power of attorney for signing corporate training projects.

In Italy continuous vocational training programmes are financed by interprofessional funds with 0.30% of contribution coming from companies. Fondimpresa is the fund constituted by Confindustria, Cgil, Cisl and Uil and manages the resources in three different accounts. Each company could use its “Training Account” (Conto Formazione) in order to train workers, on the basis of training plans agreed with trade unions representatives. The SMEs could use its

¹ The Italian Federation of Metalworking Industries

“Training Account” participating to “Additional contribution” (Contributo Aggiuntivo) calls for proposals. Alternatively there is “System Account” (Conto Sistema), which funds sectoral multiregional projects.

4) Mapping exercise

The Mapping Exercise is made up of two sections.

In the first one there are the results of the questionnaire distributed to the MET firms about Industry 4.0 technological innovations and the consecutive changes in terms of skills. In the second part there are the analysed initiatives, set up either unilaterally or jointly by social partners, aimed at developing 4.0 skills, such as continuous training, entrepreneurship education programmes, partnerships with educational institutions, promotion of school-to-work transition.

4.1) Survey on the degree of Industry 4.0 technological innovations adoption and successive changes in terms of skills

The present questionnaire has been elaborated by the Industry4EU partners and disseminated among the Italian metalworking firms. It is called “Industry 4.0 – A survey to build the future together” and is focused on the real knowledge and implementation of 10 enabling technologies which have emerged by the literature review, namely mechatronics, robotics, internet of things, big data/data mining, cloud computing, cybersecurity, additive manufacturing, systems of virtual simulation, nanotechnologies and smart materials.

The questionnaire also aims at figuring out how skills and competences are changing towards Industry 4.0 and how Federmeccanica and Institutions alike can support the labour market of the upcoming future facing new challenges linked to brand new skills. Taking together those aspects, along with the job organization, we have been able to portrait a general framework to share with our Project Partners.

The purpose is to create the right conditions for the spread of Industry 4.0 in the European countries, thus contributing to reconverting present factories and helping them to be more competitive.

Further to this, the aforesaid survey is divided as follows:

- 1st section – Company features
- 2nd section – Technological innovations
- 3rd section – Skills and competences
- 4th section – Job organization
- 5th section – Attitude towards Industry 4.0
- 6th section – Corporate culture

The present study is based on a 527-company sample of replying enterprises to the aforesaid survey. 64% of those firms (which we have renamed adopters) have declared they actually use at least one of the 10 above-mentioned technologies, while the 36% of them has not implemented any.

43,7% stands for small enterprises (employing from 10 to 49 people), followed by medium (32,4%) large (13,4%) and micro businesses (10%).

Most of the replying companies, stated that their business activity deals with the manufacture of fabricated metal products, except for machinery and equipment

(98 out of 527, Nace code n. C25) and 79 out of the total is a machinery and equipment n.e.c. manufacturer (Nace code C28).

33% of companies produces finished products for industrial customers, 19% for the market and the 21% supplies parts or components.

28% of the 64% of the adopter companies perceives to own a high level of digitalization, while the remaining percentage is divided into a 62% of medium and 9% of low level of digitalization. Furthermore, the adopters show a higher percentage of graduated in tertiary education employees (19% vs. 12%) and cooperate more than the non-adopters with research entities and Universities (59.1% vs. 26%), even though 53,5% of the total has declared they do not cooperate with the aforesaid institutions.

Among the 10 technologies, at least 50% of the involved companies have declared to be aware of the following (in decreasing order): cyber security (93%), robotics (85%), mechatronics (76%), additive manufacturing (75%), cloud computing (72%), simulation (71%) and internet of things (55%).

However, the real use of such technological innovations is not directly linked to their level of acquaintance. For instance, cybersecurity is actually implemented in 83% of cases. Robotics is adopted just in 5 firms out of 10. 49% of entrepreneurs said they know nanotechnologies, but in practice just 1 company out of 10 uses them, as for the Smart Materials known by 43% of companies but used by 1.5 firms out of 10.

Nonetheless, what is interesting too is to understand in which area companies use 4.0 technologies.

For example, in 66% of cases, cybersecurity is used in the production/management compartment, while seldom is it employed in the commercialisation one (37%).

The same for robotics, which is the most used technology among all the 10 in the production/management area, accounting for 80%, but for 8% in the commercialisation. Mechatronics is employed in 50% of companies, 69% for production/management procedures, while additive manufacturing seems to be important during the product development phase (76%) but neither for the commercialisation nor the service department (4% in both cases).

In the end, cloud computing is more used in the service area (55%), while simulation and IoT are employed the most in the product development compartment (73% and 44% respectively).

The latter, seem to have a balanced use among all the areas, accounting for the 37%, 35% and 34% in service, commercialisation and management departments respectively.

The same for Big Data which is used in the respective areas for the following percentages: 48% production/management, 33% product development, 25% commercialisation and 34% service.

Picture n. 1

9. Where do you use these technological innovations?	I don't use it	Production / Management	Product Development	Commercialisation	Service	Level of adoption
Mechatronics	50	69	43	12	11	50
Robotics	49	80	22	8	9	51
Internet of Things (IoT)	73	34	44	35	37	27
Big Data / Data mining	76	48	33	25	34	24
Cloud computing	58	44	29	20	55	42
Cybersecurity	17	66	39	37	56	83
Additive Manufacturing	68	35	76	4	4	32
Systems of virtual simulation	47	42	73	15	22	53
Nanotechnologies	89	35	78	9	7	11
Smart materials	85	43	68	8	7	15

45% of the analyzed firms are planning to invest in cyber security, in the short term; for the same lapse of time, simulation, cloud computing and robotics are more likely to be the next investments (with a percentage of 26%, 21% and 20%, respectively).

In the mid-term, robotics and cloud computing are the most relevant investments (19% each), followed by simulation (18%) and mechatronics, IoT and big data (14% equally).

Lastly, companies give more importance to smart materials in the long term (7%), nanotechnologies (6%) and, with equal merit (4%), simulation, additive manufacturing, robotics and IoT.

Unfortunately, it seems that the non-adopters enterprises are not planning significant investments for the coming years; this would lead to an ever deeper gap between them and the adopters if the former group does not plan any make up for delay.

Picture n. 2

Tech. Innovations	Total				Non-adopters				Adopters			
	Short term	Mid term	Long term	Any investments	Short term	Mid term	Long term	Any investments	Short term	Mid term	Long term	Any Investments
MECHATRONICS	19%	14%	3%	64%	5%	9%	3%	84%	28%	18%	3%	52%
ROBOTICS	20%	19%	4%	57%	8%	11%	4%	77%	28%	23%	5%	44%
IOT	17%	14%	4%	65%	4%	7%	4%	85%	25%	19%	4%	53%
BIGDATA	14%	14%	3%	69%	4%	6%	3%	88%	20%	19%	3%	58%
CLOUD COMP.	21%	19%	3%	57%	5%	11%	5%	79%	30%	24%	2%	44%
CYBERSECURIT	45%	16%	2%	37%	24%	16%	3%	57%	58%	17%	1%	25%
ADD.	11%	13%	4%	71%	5%	5%	3%	88%	16%	18%	5%	61%
SIMULATION	26%	18%	4%	51%	7%	11%	4%	78%	38%	23%	5%	34%
NANOTECH.	6%	5%	6%	84%	1%	2%	3%	94%	8%	6%	8%	78%
SMART MATER.	8%	8%	7%	77%	3%	4%	6%	88%	12%	11%	7%	70%

Surprisingly, more than 52% of the participating companies do not plan to take part in public funding projects about Industry 4.0 for R&D.

Among the adopters, the improvement of the productivity is the most significant effect due to the implementation of the technological innovations at issue. Secondly, a deeper flexibility in product and service customization is another important consequence followed by (in decreasing order) supply of new services to customers, reduction in time-to-market processes, cost optimization and increased information relating to production processes.

The third part of the survey is focused on skills.

First of all, our features show that the average annual working hours pro capita dedicated to skills development through training (referring to managers, employees and workers then), is about 30 hours (29,7 to be more exact).

More specifically, adopters declared they have remarked some kind of change in people soft skills outcomes following the introduction of new digital technologies. For instance, on a scale base ranking from 0 (= no change) up to 4 (= greatest degree of change) autonomy, accountability, flexibility and proactivity scored 2,3 points, followed by problem solving and team working (2,2) and digital communication (2,1).

The following question regards what kind of specific skills the adopters companies hold among their personnel; IT infrastructure management accounted for the 80%, followed by coding (63%) and data analytics (61%). This latter and the first one, seem to have specific implementations; IT infrastructure management is very relevant for the IT security management (88%) and cloud, sensors and server management (83%), while data analytics is judge to be important in reporting systems (80%) and decision making activities (69%).

Another fundamental aspect of the present research, is the impact such technological innovations have on job organization.

We have focused our attention on two specific aspects, namely smartworking and knowledge sharing.

On an average basis structured as in the case of the change of soft skills, the replying companies scored a 2,37 points in knowledge sharing and 2,05 in smartworking.

We have used the same question format to introduce the 5th part of the survey, regarding the expectations linked to Industry 4.0.

The following picture shows the general sentiment of our companies towards Industry 4.0

Picture n. 3

Industry 4.0 expectations	
18. Do you think:[0 = total disagreement; 4 = total agreement]	
Industry 4.0 can also be implemented gradually with contained investments, even without radical changes in the basic technology normally used	3,07
Industry 4.0 is unsuitable for SME's	1,6
Industry 4.0 requires important investments	1,8
Industry 4.0 allows big compagnie to be more agile and therefore “threaten” SMEs	1,9
Industry 4.0 allows SMEs to be more efficient and competitive in the market, Thus “threatening” big companies	1,9
Industry 4.0 enables product customisation which can amplify competitive strength	2,3
Industry 4.0 is a passing trend	0,9
Industry 4.0 is important, but it requires skills that we don't have	0,8
Those who fail to grasp the opportunities offered by these innovations are likely to be excluded from the market	2,2

The last part of the survey is focused on companies corporate culture.

We asked our firms what actions should they undertake in order to facilitate the change towards Industry 4.0.

It seems that the staff lifelong learning is the most relevant factor to work on (2,8 out of 4), followed by the reorganization of the company structure (2,7) and a brand new managerial culture (2,5).

Finally, what firms require to Federmeccanica is more awareness of both National and European financial instruments (60,53%) as well as a communication strategy in order to spread best practice examples and attract the entrepreneurs interest and awareness (59,39%).

4.2) Social dialogue initiatives aimed at developing the skills necessary for the development of Industry 4.0

As touched upon, Fondimpresa funds the sectoral multi-regional training plans through “System Account” calls for proposals, which cover different items. In particular, it’s possible to develop the skills 4.0 under the areas “Competitiveness” and “Technological Innovation”.

For example, the call for proposals n. 1/2016 about company competitiveness has funded training measures directly related to qualification of production processes and products, organisation innovation, digitalization of business processes, e-commerce, net contracts, internationalisation.

In the metalworking sector, the most important social dialogue initiatives in this field are linked to the activities set up at national and local level by joint Committees for vocational training and apprenticeship.

These Committees are responsible for analyzing and reaching an agreement upon the training plans: only the most innovative ones could be signed jointly by Social Partners this way giving them the chance to participate to the calls for proposals.

Furthermore, the Committees monitor the metalworking training plans financed and share the results. On March 17th 2016, National Social Partners organized the Conference “Lifelong learning for Industry 4.0” in order to present the monitoring realized by some training centres on innovative plans developed under the call for proposals 4/2014.

4.3) Unilateral programmes aimed at developing the skills necessary for the development of Industry 4.0

Employers' Associations and Trade Unions are aware that fast and high quality school-work transition is fundamental in the fourth industrial revolution. For this reason, Social Partners are improving the relationship with educational actors, from primary schools to VET providers and Universities.

In order to map these unilateral programmes, Federmeccanica has sent a sheet to its local Industrial Associations and to Metalworking Trade Unions, which has been filled with continuous training activities, entrepreneurship education programmes, partnerships with educational institutions, promotion of school-to-work transition initiatives. Each programme has been described, with a focus on promoters, objectives and target groups.

Continuous Training

The approach of this section is to deal with continuous training in a wide perspective. For this reason several initiatives will be described, even not strictly related with the training of workers.

The project "Education and Innovation" is developed by Confindustria, Fondirigenti, Intesa Sanpaolo and Confindustria SMEs with the aim at identifying new skills for Industry 4.0 in the sectors Advanced Manufacturing, Aerospace, Biomedical, Fashion Industry. The long term purpose is to identify useful tools to enhance the enterprises investment in training, which should become a real parameter which determines creditworthiness.

Confindustria Firenze has built up an executive program in manufacturing big data, addressed to all the companies which want to implement the digital transformation of processes. COSEFI, Polytechnic University of Milan (Graduate School Of Business) and University of Pisa are partners of the project.

The program provides ad hoc training about supply chain management, innovation culture, big data. There are 50 hours of frontal lesson, 8 hours through FAD and 15 hours of project work.

Similarly Confindustria Bari, Polytechnic University of Bari and the Business School of "Il Sole 24 Ore" have developed the Master course "Innovation and Digital Transformation", in order to foster the managerial and operational skills and, at the same time, to organize and supervise the processes of innovation and digital transformation in the companies. The Master course is divided into three modules, namely "Digital Strategy & Innovation", "Digital Strategy and Business Impact", "Digital Technologies and Solutions for Digital Transformation". Its target groups are managers, entrepreneurs and professionals who want to improve their ability in understanding and managing innovation projects also on the basis of new digital technologies.

Confindustria Bergamo has organised two different training programmes known as “Industry 4.0 @ Confindustria Bergamo” and “Tips 4 Smart Manufacturing”, addressed to managers and young employees, respectively. The first one was developed in 2015 with FORMA - Sistemi Formativi Aziendali (training school), Intellimech (Consortium for the mechatronics), Fraunhofer IAO, Fraunhofer IEC and wanted to get the companies aware about Industry 4.0 in order to implement smart manufacturing projects. The training pathway involved 40 managers and was structured in:

- face-to-face training meetings (12 hours)
- tour in Stuttgart at the “Mini-factory” created by Fraunhofer IAO
- inter-enterprise working groups with the aim at developing project ideas
- final conference with results and agenda with next objectives

At the same time, “Tips 4 Smart Manufacturing” was a training initiative for young employers in order to share best innovative practices. Six meetings were carried out in 2016 including a visit in the high technological enterprise ABB.

On the Trade Union hand, Fim-Cisl, in collaboration with its local associations, employers’ associations, training centres, interprofessional funds and training committees, has realized since 2009 the project “Rewind”, which wants to train trade unions delegates on the duties and responsibilities foreseen in the NCAL about vocational training. The project deals with all the training cycle, from skills need survey to supervision, monitoring, and effectiveness analysis of the action. More than 2.300 delegates and 140 secretaries have been trained in 107 seminars, which are always more frequently focused on Industry 4.0 implications. In line with this, the workshop held in Terni on November 15th 2016 was about “Vocational training and qualification in Industry 4.0”.

Entrepreneurship Education Programmes

Eureka! Funziona! is the entrepreneurship programme developed by Federmeccanica, in agreement with the Ministry of Education and the support of Local Employers Associations, addressed to students of 3rd, 4th, 5th years of primary education. The project wants to create entrepreneurs of the future, orienting children towards scientific and technical education. Federmeccanica supplies schools with some kits composed by generic materials (such as wood, paper, rubber and so on) and the students have to create a toy which applies a physical principle such as pneumatics, mechanics or magnetism. The main topic of the fourth edition has been the automation, in order to introduce children to Industry 4.0. With Eureka! Funziona! 4.0 have been supplied 2.200 kit, involving 11.000 students from 28 cities.

Local Employers Associations promote entrepreneurship education programmes also for the students of secondary education. For example the young employers of Confindustria Padova develop “Focus upon companies” with the aim at developing knowledge about creating innovative business.

In the project, each class simulates a business activity and should invent, promote and sell an innovative product or service in order to solve a real problem or need emerged in the city of Padova. Furthermore, the students visit some companies, verifying how an idea could become reality.

Students learn both technical (such as swot analysis) and soft skills (team working, public speaking, time management, activity planning).

Partnerships with Educational Institutions

Social Partners and Educational Institutions are working hardly in order to build strong, efficient and long-lasting partnerships which can allow to align the supply and demand in terms of skills of young people.

The most interesting example of partnership is represented by the Territorial Labs for the Employability, which are promoted by the Ministry of Education under the National Plan “Digital School” with 45 millions financement.

These are living labs addressed to students and NEETs, in which is possible to: foster youth employability and guidance, promote entrepreneurship activities, align students’ skills with enterprises’ shortages, develop digital skills for industry 4.0 and computational thinking, spread school-work alternance and apprenticeship.

In this framework the Labs are created with the cooperation among Municipalities, Educational Institutes, local Employers Association and firms in order to orient the schools to territorial needs and the training activities to strategic sectors of the local productive district.

For example, LAB 4.0 is developed in Reggio Emilia by Unindustria, 8 secondary schools, 2 tertiary institutes, the Municipality, the Chamber of commerce, Bank foundations, the Foundation for industrial research and technology transfer, the local FabLab and training organisations. This centre is deeply focused on continuous innovation, in order to create new specific and flexible professional profiles which can manage competences for Industry 4.0 such as:

- Human-Machine Interfaces (HMI) designing
- HW and SW prototyping
- Data Analysis
- Predictive maintenance systems designing
- 3D production chain simulation
- Visual Communication (tutorial, webinar, pitch)
- Team working
- Process working
- Autonomy
- Self entrepreneurship

Also the Territorial Labs for the Employability “S.M.I.L.E.” and “SAIL – Smart Automation Innovative Laboratory”, developed, respectively, in Bergamo² and Brescia³, are “totally connected” centres which deal with innovation and school-work interconnection. Under “S.M.I.L.E” project there have been created 3 different labs (at secondary schools “Paleocapa” and “Natta” and at Scientific Park Kilometro Rosso) in order to provide specific training for Industry 4.0 and to tackle early school leaving. Likewise “SAIL” wants to create the skills 4.0, fostering youth employability and “Made in Italy” sectors, such as automotive, electrical components, industrial automation, precision engineering and metal processing, which are fundamental for the manufacturing base of Brescia.

Another important initiative of partnership is represented by the “ITS”, pathways of non-university tertiary education (Level 5 EQF), characterized by higher technical specialization. Its organizational model is the Foundation, composed by the collaboration among enterprises, universities, scientific and technological research centers, local authorities, the education and training institutes.

Each course lasts for two years (1.800 – 2.000 hours) and foreseen a period of work-based learning (at least 30% of the duration). It’s possible to reach this title through an apprenticeship contract.

The ITS offer training courses related with six technological areas considered as strategical for the Italian economic development and competitiveness, namely: Energy Efficiency, Sustainable Mobility, New technologies for the life, New technologies for the “Made in Italy”, Innovative technologies for the cultural activities – Tourism, Technologies for the Information and Communication.

Among the “New technologies for the Made in Italy” Area, there are training pathways related with the mechanic - mechatronic system, which allow to achieve the professional profiles “high level technician for the process innovation and mechanic products” and “high level technician for automation and mechatronic systems”. These profiles are deeply oriented to Industry 4.0 requirements and the young people graduated in this area are endowed with strong specialized skills and work experience.

There are other examples of school-work partnership, such as the training pathways for teachers.

For example the young employers of Confindustria Bergamo and the territorial School Office promote “Lean Production and Smart Manufacturing”, an initiative about Industry 4.0 principles addressed to teachers responsible for alternance programs, which takes into account traineeships too; likewise the project “Development of Strategic Skills for Learning Experts” is developed by

² The partnership is composed by: Confindustria Bergamo, Education institutes “Paleocapa” and “Natta”, Kilometro Rosso, Firms, Cluster Fabbrica Intelligente Lombardia, University of Bergamo, Consortium Intellimech, Association BergamoScienza, Municipality of Bergamo.

³ The partnership is composed by: Employers Associations of Brescia (AIB, APINDUSTRIA, CNA), 8 Secondary Schools, 2 Universities, Municipality of Lonato, 4 Temporary work agencies, Companies (CamoZZi; Feralpi; TiesseRobot; System Technology; Officine Meccaniche Rezzatesi; Automazioni Industriali).

Confindustria Padova with Niuko (training provider) with the aim at supporting teachers in the creation of school-company relationships.

Confindustria Padova organises, with the collaboration of Carraro Spa, the “Olympics of Machines And Mechanical Talents”, in order to share new production technologies with the schools.

The students of secondary education (IV and V class) work in team and take many tests on different areas: technology, lean, technical design, CNC programming, cyber-security, management, and so on.

Students also visit the production departments of Carraro Spa, meanwhile the teachers participate to training pathways about Industry 4.0. The initiative is realized also in Treviso and Vicenza.

Promotion of School-to-Work Transition

The agreement between Federmeccanica and the Ministry of the Education signed in July 2014 is deeply oriented towards the promotion of school-to-work transition.

On the basis of this agreement has been developed the project “Traineeship”, the first alternance programme set up at national level after the Law 107/2015 about the educational system, which strengthens the “school-work alternance” introducing 400 hours of on-the-job training during technical and VET education.

The project objectives are disseminating and strengthening the school-work alternance, developing the laboratorial teaching, increasing the level of employability of young people, aligning their skills and competences to the needs of the labour market, also recognizing the equivalence between school-based and work-based training, promoting the school-enterprise cooperation, spreading best practices implemented at local level and leading them to system.

“Traineeship”, which involves 50 VET institutes, 5.000 students and more than 500 MET firms, was launched in March 2016 and will last until July 2017. The main characteristics of the project are the firm-school “co-planning” of both activities and assessment criteria, along with a concrete on-the-job training for students, a joint training for both tutors and the certification of the acquired skills. In the project, many companies are testing a system of students rotation on the same working station: in this way also the SMEs can provide on-the-job training to a large number of young people.

The firm-school co-planning at issue is the pillar of the project because both internal and external tutors are responsible for pointing out the competences that the students will achieve during the years, describing each skill into different performances.

For these reasons, “Traineeship” triggers a real innovation process because it promotes a pattern of school-work alternance that supports a change of the teaching organization.

Also INDIRE, the National Institute for Innovation and Educational Research, cooperates on the project: it is responsible for the qualitative monitoring and has

made available an online platform in which is possible to upload the documents (planning docs, school-firm agreements, training pathways, etc.) and organize webinars.

The promoters (Ministry of Education, Federmeccanica, Indire) are discussing the possibility of carrying on the second year of the project, in order to involve double VET institutes.

Another example of promotion of school-to-work transition is represented by the programme “Technical tests for business” developed by the Young Employers of Confindustria Padova towards the students of upper secondary education (III, IV and V class). The project, in particular, wants to give to students the soft skills required in the labour market 4.0, as far as they are recognized more and more important to the companies. In the project, entrepreneurs and temporary staff agencies responsible organize specific seminars with the aim at preparing students to take on the stage periods, teaching them all about the work environment, from the economic system and labour market 4.0 to the job profiles and competences of the future. These instruments are very important for young people, in order to speed the school-work transition.

5) Outcomes

The deep analysis carried out through the mapping exercise is very important to understand the Industry 4.0 phenomenon in Italy.

Thanks to the questionnaire a landscape with lights and shadows has emerged, considering the deep differences between adopters and non-adopters.

The former group of companies perceives to have a higher level of digitalization, it shows a higher percentage of graduated employees and it cooperates more than the non-adopters with research entities and Universities.

Adopters who judge their firms to have a high digitalization level, give more importance to the output development as well as a quicker time-to-market procedure and to the use of the virtual systems for planning and prototypes. But, above all, the adopters are more willing to invest in new technologies. Unfortunately, it seems that the non-adopters enterprises are not planning significant investments for the upcoming years; this would lead to an ever deeper gap between them and the adopters if the former group does not plan any make up for delay.

However, as emerged from the expectations section, Italian companies are conscious that Industry 4.0 is not simply a buzzword, but a real challenge which should be deployed in order to amplify competitive strength. In spite of this, they think it is an evolutionary process, which can be implemented gradually.

In this process, skills will be playing the major role.

Autonomy, accountability, flexibility, decision making, problem solving, team working and digital communication are indicated as the most important soft skills for Industry 4.0. At the same time, the technological innovations will be concretely managed through data analytics, IT infrastructure management and coding skills.

Continuous staff training, as well as top management's (entrepreneurs and managers), will be crucial in order to manage the transition towards Industry 4.0. For this reason Italian Social Partners (Federmeccanica, Fim, Fiom, Uilm) have introduced an individual right to be trained in the metalworking NCAL and are willing to launch a national campaign aimed at filling the digital skills gap.

Nevertheless, changes will affect all the learning cycle, thus influencing also the educational institutions. As described above, Employers Associations are strengthening the partnerships with these subjects, with the aim to develop school-work alternance projects, entrepreneurship education programmes, vocational guidance activities, training initiatives for students, NEETs, teachers, entrepreneurs and workers. Also in this context, we are dealing with an evolutionary process, which needs to be strongly fostered during the next years, in order to build a new educational model which could increase the competitiveness of the Italian industry and the Country in general.

6) Problems emerged in the mapping exercise

The research contributes in understanding the state of art of Industry 4.0 and initiatives aimed at developing the skills 4.0 in the Italian metalmechanic sector.

The major concerns are about the limited awareness and willingness to invest of the companies, the difficulties in creating school-firm partnerships and training pathways, the differences among regions and the limited number of social dialogue initiatives about the topic.

In particular the partnerships among productive and educational systems are well developed only in some places, in which the collaborations are structured from many years, also thanks to the role of Employers associations. In many places this system isn't structured and there are problems in aligning school and firm needs and planning the students' curricula.

However, the unilateral initiatives described before, represent best practices, which could be spreaded among all industrial associations and companies in order to give a successful model to all stakeholders which want to improve the relationships with the schools.

In spite of this, the research shows that social dialogue isn't a common practice in developing partnerships with educational institutions and alternance programmes. As Social Dialogue is very important in providing high quality training for the staff, likewise it could be a useful tool in enabling Industry 4.0, as well as school-to-work transition. Employers associations and trade unions could boost Industry 4.0, designing and promoting new forms of participation and innovative training pathways pointed towards workers and students.

The fourth industrial revolution is creating new spaces for Social Dialogue and the Social Partners should work hard in order to increase the collaborations about these topics, thus strengthening it.

7) Perspectives of analysis

We believe the “Industry4EU – Industry 4.0 for the future of manufacturing in the EU” Project, is leading to a deeper acquaintance of the skills that will be fundamental to the labour market of the upcoming future in the European framework.

All the stakeholders involved in the research have contributed to understand the phenomenon and the actions which need to be put in place in order foster Industry 4.0 in Italy.

Generally speaking, the Italian manufacturing companies appear to be slightly aware of the phenomenon at an initial stage. For this reason, Federmeccanica believes that two different approaches shall be planned; on the one hand, the adopters have to be helped glimpsing a “common thread” to the technologies and the skills of the future as well as understanding how to develop new business models; on the other hand, the non-adopters should face their fears towards Industry 4.0 and realize that a step-by-step introduction is possible too.

For this reasons, Federmeccanica is willing to develop actions addressed to entrepreneurs, schools, Institutions. Hereby some examples:

1. Webcasts: webinar created with the aim at spreading the awareness and the knowledge of entrepreneurs;
2. Training measures for entrepreneurs: multimedial contents with literature reviews, business cases, financial instruments about technologies, skills, labour organization;
3. Continuous dialogue with schools: seminars with Traineeship schools about Industry 4.0 and strengthen partnerships with them;
4. Social dialogue: fostering the activities of national committee about continuous training and implementing the new individual right to be trained;
5. Lobby: continuing the lobby activities towards institutions.

As pointed out previously, Industry 4.0 is a process, which, day by day, is showing new interesting points of view.

In this context we believe that it’s important to give value to the partnership established with this project, which should continue and broaden the research, examining new items and increasing the awareness about the topic.

8) Final conclusions and remarks

As emerged from the survey, Industry 4.0 can be perceived as an evolutionary process, which can be implemented gradually. Nevertheless it will be disruptive with regards to technologies, production models, organization and skills.

The skills will change deeply and quickly. For this reason educational institutes should rethink their organization and should innovate training pathways and the knowledge-transmission model as soon as possible, enabling students to acquire digital and relational capabilities.

The only way to make Industry 4.0 suitable is to increase more and more the cooperation between education-training and work, creating labs for employability, supporting teachers experiencing on-the job training, developing innovative alternance projects, betting on continuous training of the staff.

All the technological innovations should be managed by human resources, which will be crucial in the fourth industrial revolution. The success of the enterprises depends on the quality of the human factor, which is raising its importance in the new working model. Companies should invest on it, providing training to the staff, involving workers in strategical decisions, giving importance to the merit and paying it on the basis of the results, training and orienting young people, which will be the workers of tomorrow.

In summary, we state that enterprises, in order to catch all the opportunities of Industry 4.0, should create strong partnerships with educational institutes (VET schools, ITS, Universities) and give more and more importance to the human factor; at the same time its should start with a gradual digitalization process, providing even small investments or employing already existing plants, in order to get the potential of innovations. As international competition strengthens, there will probably be a real gap on technologies, management and skills, which can be filled only with awareness about the topic, investments in technologies and workers, staff training, partnerships with the education system and collaboration with trade unions.

We need to start small from tomorrow, but think big.