EU POLICIES AND NEW PROFESSIONAL SKILLS FOR THE INDUSTRY 4.0
EDUCATIONAL STRATEGIES FOR SMART MANUFACTURING: PREPARING FOR FUTURE GROWTH AND INNOVATION

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ABSTRACT
The advent of the Fourth Industrial Revolution has profoundly changed the relationship between the individual and the society in which he lives. The innovation produced by digital technology, robotics and internet services, is producing significant social repercussions in the fields of education, higher education, the world of work and professions. The policies of the European Union in the last decades have designated a general framework to manage the phenomenon of change induced by the development of technology in the European population. Through active policies of support to the Member States, a competitive, but careful economy, which does not produce social exclusion can be developed. The promotion of education at all levels, support for universities and high-level training institutions, implementation of a social dialogue between institutions, businesses, citizen associations, are key points to prepare European citizenship for the impact of the Fourth Industrial Revolution. Education and Universities have the task of preparing the European citizen to redesign their professional skills, which will be constantly modified by technological progress. The same digital technology invests in the world of the University and the institutes of Higher Education, and outlines the directions, the contents, the forms, in a dialectic of mutual influence on their following impact. The social dialogue also contributes to creating productive relationships between training institutions and universities, businesses and institutions, as demonstrated by the example of the European Passport of professional skills. The exchange of information between stakeholders, through a comparative study of the contents and services offered, represents the EU’s challenge for managing the effects of the Fourth Industrial Revolution.

KEYWORDS: Competences, EU policy, social dialogue, university comparison

INTRODUCTION

Out of the many elements that contributed in defining pivotal paradigms as to how to proceed, on which policy to implement as well as answering main questions essential to its reflection, March first 2017 white paper published by the European Commission is to be outlined. Entitled On Europe’s future. Reflections and scenarios for the EU composed of 27 members, toward 2025, it presented five scenarios of possible modifications to be made within ten years. The main question was formulated in such a way: “which future do we wish for ourselves, our children and our Union?” In the document, Europe is presented as the World’s greatest common market, the primary commercial power and the leading contributor of humanitarian aid for development. Its currency figures as the second most used. Despite such an avant-garde position in terms of innovation, owing to initiatives such as the Horizon 2020 program, it seems that Europe’s economic power
is destined to decrease significantly in the future, in terms relative to its world gross domestic product (GDP). Even if today Europe stands at about 25% of the World’s GDP, previsions suggest that it would already stand at approximately 20% in 2030.

Such a reality is a reflection of a global movement in which parts of the world are expanding, while the global weight of Europe is expected to diminish. Demographic considerations are here fundamental. Indeed, if in 1990 Europe accounted for 25% of the World’s population, it is forecasted that its 2060's level will be equal to or even inferior to 5%. In such a context, Europe will be confronted to new challenges as a progressively aging population. It is anticipated that in 2030, Europe’s population median age will be of 45 years old. Europe would therefore become “the oldest region of the World”. This would result in significant implications. We are here referring to new family structures, demographic changes linked to a significant mass immigration, urbanization, all factors considered decisive in determining and affecting social cohesion. The white paper highlighted how “in the arc of a generation, the typical European worker has evolved from having a lifelong workplace to more that ten different jobs throughout their career. The number of working women has been the highest ever recorded in History, but residual barriers are yet to be broken down to attain a true gender equality”.

Also, in our modern era, fundamental transformations shaped by a high rate of development of technologies and information systems have profoundly permeated our society. The collective dynamics at a social and individual level have altered the relationship between the European citizen and the society in which they insert. The theme of globalization itself has induced significant modifications in the economic, social and production dynamics, and this particularly for what concerns the world of work.

As validated by many research institutes in the field of work and professions, the European Commission had to acknowledge the impact of the progressive computerization of the society, creating new faster professions and at the same time decreeing the disappearance of others. In this regard, the white paper emphasizes that “many of the present professions did not even exist ten years ago and many others will be created in the upcoming years” whereby “it is forecasted that the majority of the children that start elementary school nowadays will eventually exercise in professions that are currently non existent”.

In this regard, the theme related to work and professions results to be one of the main concerns of the European Commission, since the challenges posed by the increased use of technology and automation are expected to have a substantial effect on all sectors and in all fields of work. Therefore, the Commission’s priority is to make the most of the opportunities relevant to such changes. That should be grasped through a massive investment “in skills” and in “rethinking the Education system and the permanent learning systems” as well as through the simultaneous introduction of “new social rights to support the evolution of the field of work”.

One must recall that, with the Lisbon Council of the year 2000, the European Community had officially ratified its full entry in the Knowledge Society. To fight against social exclusion, all individuals including those marginalized will have to adopt a new perspective, globalization as well as the effects produced by the evolution of technologies and information systems seen as the sponsors of new attitudes; ongoing revision of individual professional status through implementation and updating of the knowledge, skills and qualifications are here the new paradigms. According to such assumptions, investing in education and training represents the
main way to modernize and develop the potential of Europe and its citizens.
In such a perspective, the theme of “lifelong learning” has become a necessity, as well as an opportunity. This concept has become European Community's battle horse. An adequate professional insertion of the individuals can certainly represent an essential component in the fight against unemployment as well as social exclusion. In such a setting, one must understand that the EU planning of political strategies for coordination and support on the theme of lifelong learning seems already outdated by the evolution of technology. A profound rethinking of the relationship between the individual and society in the perspective of the exponential development of the possibilities offered by technology are the main issues to be addressed. This should impact the adults’lifestyles in a profoundly transformed society. In such a perspective the European institutions are at the crossroads of defining links between the production aspects of wealth and their social impacts.

**THE EU initiatives. From the society of knowledge to Industry 4.0**

Already in the Conclusions of the Presidency of the Lisbon Council of March 23 and 24 of year 2000, it was identified that the world was going through a period of profound transformation, due to different economic, social and productive factors. The document declared “The European Union finds itself before an epochal turning point resulting from globalization and from challenges originating from a new economy based on knowledge. These changes affect every aspect of people's life and and they require a radical transformation of the European economy”.

In reality as early as in the 1980’s, indicators had emerged to that effect, as evidenced in in two white papers produced by the European Commission in 1993 and in 1995 - respectively Growth, competitiveness, employment. The challenges and the ways to go to enter in the 21st century, and Teaching and learning. Indeed, it is reported that “the rapid and ever-increasing pace of change urgently requires the EU immediate action to take full advantage of the benefits of opportunities that occur. It follows that the Union needs to establish a clear strategic objective and to agree on an ambitious program to create the infrastructures of knowledge, to promote innovation and economic reforms, and to modernize the social security and education systems”. On these assumptions, in a document elaborated in the year 2000, the European Community declared that its new strategic objective was to “become an economy based on the most competitive and dynamic knowledge of the world, in such a way to realize a sustainable economic growth with new jobs and a better social cohesion”. To get to realize such a ambitious goal, the actions recognized as required in a near future by the European institutions consisted in:

- preparing for the transition to a knowledge-based economy and society, in improving the policies on the information society and on R&D, as well as in accelerating the process of structural reform for competitiveness and innovation and in completing the internal market

- modernizing the European social model, investing in the people and fighting against social exclusion

- supporting the healthy economic environment and the favorable growth prospects in applying an adequate combination of macroeconomic policies
In the following decades, the activities of the European institutions intensified, with the objective of providing the Member States with coordination instruments and policies aimed at supporting the development of a lifelong learning system. This should have led to greater integration between peoples of Europe and to social cohesion, substantiated by the fight against unemployment, marginalization as well as the protection of the disadvantaged.

In continuity with such a perspective, the European institutions introduced subsequent measures that contributed in defining the topics of lifelong learning, development and recognition of knowledge, as well as qualifications and skills, in the context of globalization and of the Society of Knowledge as already asserted during the Lisbon Council of March 23 and 24 of year 2000. Among these, the most important initiatives are the December 15 of tear 2004 Decision (2004/2241/CE) on a single Community framework for the transparency of skills qualifications (Europass), the Directive 2005/36/CE of December 7 of year 2005 on the recognition of professional qualifications, the Recommendation of the European Parliament and of the Council of December 18 of the year 2006 (2006/961/CE) on the transnational mobility of the Communities for vocational education and training purposes: European quality card for mobility, and the following on the same day, the Recommendation (2006/962/CE) on key competences for lifelong learning, the Recommendation of the European Parliament and of the Council (2008/ C111/01) of April 23 of the year 2008 on the establishment of the European Qualifications Framework for lifelong learning, and finally the Council Resolution (2011/C 372/01) on a renewed European agenda for adult education.

Particularly important is the text of the Council conclusions of May 12 of the year 2009 on the strategic framework for European cooperation in the field of education and training (ET 2020) (2009/C 119/02) as it contains the main themes relating to the path that the European Union should have supported in education and training up to 2020.

The will repeatedly expressed by the European institutions could only be that of building a solid framework for cooperation in the relevant sectors through the development of complementary tools at the EU level, the exchange of good practices to be implemented through the open method of coordination.

With greater emphasis, the correlation between education and training, as an investment in human capital, as well as the growth of employment in a sustainable form are identified as determinant. Two essential points are pointed out:

1. education and training have a crucial role to play in meeting the many socioeconomic, demographic, environmental, technological challenges facing Europe and its citizens presently and in the years to come
2. efficient investments in human capital through education and training systems are an essential component of the European strategy to achieve the main objectives of the Lisbon strategy, namely high levels of sustainable growth and knowledge-based employment, while promoting personal fulfillment, social cohesion and an active citizenship

In this perspective, the Council conclusions of 2009 accentuated the role played by lifelong learning in the process of building up European cooperation. “In fact, lifelong learning should be the framework, which aim to cover learning in all contexts, be they formal, non-formal or informal, including all levels of education from early childhood to higher education and professional and adult training.”
The Council's four strategic objectives for the 2020 strategy were thus identified as:

- **Strategic objective number 1: ensuring that lifelong learning and mobility become a reality.** Given the complexity of the Knowledge Society and the changing economic and social circumstances imposed by globalization, updating and developing skills has become a necessity. The first objective of Strategy 2020 is aimed at promoting the “development of national qualifications frameworks based on their learning outcomes and their link to the European Qualifications Framework, the establishment of flexible learning paths - including better transitions between the various sectors of education and training, a greater receptivity to non-formal and informal learning, and a greater transparency and recognition of learning outcomes. Further efforts are needed to promote adult education, to improve the quality of career guidance systems, and for learning itself to become more appealing in general - also through the development of new forms of learning and the use of new teaching and learning technologies”.

- **Strategic objective number 2: improving the quality and the efficiency of education and training.** This second objective aims at creating high quality education and training systems to guarantee the success of Europe and enhance employability. The acquisition of fundamental competences at all levels of education and training to be guaranteed to each individual is the cornerstone as to allow the maintenance of Europe’s strong global role. This is established on the substantial acquisition of basic skills from which any improvement of skills can derive.

- **Strategic objective number 3: promoting equity, social cohesion and active citizenship.** Here we refer to the accessibility for all citizens to the use, updating and development of skills able to ensure their employability, in a context of the promotion of active citizenship and intercultural dialogue. The prevailing concern at this point is the capacity of the education and training systems to be inclusive of all social levels, with a particular attention to the disadvantaged. In fact, “giving all young people the means to interact positively with other young people from different backgrounds, education should foster intercultural competences, democratic values and their respect for fundamental rights and the environ”.

- **Strategic objective number 4: encouraging creativity and innovation, including entrepreneurship at all levels of education and training.** The development of creativity and the sense of innovation are seen as sponsor of the creation of businesses promoting Europe’s competitiveness at international level.

What is at stake is the promotion of acquisition by European citizens of fundamental transversal skills. We are referring here to learning skills, digital skills, initiative and entrepreneurship, cultural awareness, etc. A partnership between the business world and the sectors of education and training is here essential in order to further the concentration of technical skills required by the labor market.
In the perspective of a greater structuring of the efficiency of cooperation at European level, for such strategic objectives to be pursued with determination, the use of an open method of coordination enabling the development of different synergies between the different education and training systems is essential.

This method of coordination has to be based on:

- common tools and approaches
- peer learning and the exchange of good practices, including the dissemination of results
- concrete elements and data from all European agencies, European networks and competent international organizations
- full exploitation of the opportunities available in the context of lifelong learning

To strengthen the education and training systems, in line with the strategic objectives presented above, the financial resources of the European Structural Funds can be used. Furthermore, a process of control by the European institutions is foreseen to ascertain the obtainment of the expected results. It should be underlined that despite the many initiatives described above, the objective of creating a structure able to encourage continuous training in Europe, with particular attention to adult education, has not yet reached the expected levels and the desired effects. Above all, the level of acquisition of transversal skills remains of crucial importance in the establishment of a European professional structure that could, in a certain sense, bring Europe out of the ongoing economic crisis of the last few years.

With the Council Resolution of 20 December of year 2011 (2011/C 372/01), despite the strong support that for a smart, sustainable and inclusive growth, lifelong learning and skills development are defined as key elements able to respond to the current economic crisis. It is highlighted that “Adult learning is currently the weakest link in the development of national systems”. While recognizing that much work has been done, and that an improvement in the overall situation in the sector has indeed been achieved, it is recognized that we are far from achieving the objective set by the 2020 Strategy on Education. Concerning lifelong learning, a share of 15% of Adult Learning participation in the total calculation was anticipated.

In the 2012b Joint Report of the Council and the Commission on the implementation of the Strategic Framework for European cooperation in education and training (ET 2020) (2012/C 70/05), with reference to the previous document, the analysis goes in the same direction: “although participation in education and training has increased in the first years, recent data on the participation of adults between 25 and 64 years to education and lifelong learning has demonstrated a slight tendency to decrease. The current level of 9,1% in 2010 is significantly lower than the benchmark criteria set in the 2020 Strategic Education and Training Framework to be achieved by 2020”.

In the subsequent Communication from the Commission to the European Parliament, the Economic and Social Council and the Committee of the Regions, Rethinking education: investing in skills for better socio-economic outcomes of 20 November 2012, (COM (2012a) 699 Final), is a political evaluation that examines the current crisis situation, and projects it in the immediate future in view of the strong competition produced within the global market. Given the premisses
establishing a correlation between skill development and the promotion of competitiveness growth, the problem stems from the recognition that Europe, is suffering from the exponential growth of its competitors and is not able to react adequately. In fact, “the massive increase in the offer of highly qualified people, registered worldwide in the last decade, puts Europe to the test. The era in which the competition was mainly represented by countries that were only able to offer unskilled labor is over. The quality of education and the supply of skills have improved worldwide and Europe has to react”.

According to the same Communication, “European education and training systems continue to fail to provide the appropriate skills for employability and do not adequately collaborate with companies or employers to bring learning closer to the reality of the world of work. This failure to meet demand and supply of skills raises a growing concern as to the competitiveness of European industry”.

The highlighted problem is that by 2020 a further 20% of jobs will require higher-level skills. According to this perspective, it is becoming essential to raise the educational standards and make the way to promote transversal skills so that the young - among others - can express adaptability proportionally to the change in the labor market. This is essential for those entering the world of work for the first time, but it is equally basic for those who must constantly follow the developments, or those who must find access to a new job.

According to this perspective, the Communication insists on the development of transversal skills, considering that, according to forecasts of the CEDEFOP, European Centre for the Development of Vocation Training, the percentage of jobs with tertiary level qualification requirements in the EU will increase from 29% in 2010 to 34% in 2020, while the low-skilled jobs will decrease from 23% to 18% during the same time lapse. It derives that “the transversal skills, such as the ability to solve problems and work in teams, will allow to confront the professional paths that are nowadays diversified and unpredictable”.

In this globalized context, mastery of several languages is of highest importance, undoubtedly constituting a factor of competitiveness. Such an asset favors greater employability and mobility, while a limited level of linguistic knowledge represents an obstacle to the free movement of workers. The first European survey on language skills showed that the level of linguistic knowledge at the end of the upper secondary education cycle is not particularly high. For example, the percentage of polyglots has only reached 14% of the population in France and 9% in the UK.

In addition to learning multiple languages as an essential condition for a greater employability, the aforementioned document proposes to improve educational activities through VET systems aiming for excellence. By VET we mean “vocational education and training”, i.e. a dual system of training-work aimed at a better collaboration between the two worlds, to design a continuity - not only idealistic - between education and the development of professional skills. The real purpose is to produce a system that would facilitate a simpler insertion of people into the world of work, as well as promote the offer of their own contribution to the innovation, growth and competitiveness of the company welcoming them.

However, the Communication declares that “learning at work and in particular apprenticeships and other dual models contributing to a smoother transition from study to work, require the presence of a well-defined normative framework, a clear definition of the roles of the different actors involved in the processes, all of which have to be integrated in the overall education system. The basic approach of the dual system, ie classroom training with parallel practical
experience at work, has a potentially important role to play at the tertiary level”. It follows that in European countries where this system is particularly developed (namely in Germany, Austria, Denmark, the Netherlands), training is strongly influenced by the demand, with the relative overall orientation of the employment policies, while in the Mediterranean countries, the road to go to such a reality is still very long.

To implement VET systems, the Communication refers to the use of European tools in the field of qualification (EQF - European Qualification Framework), credits (ECVET - the European Credit System for Vocational education and training), and quality assurance (EQUAVET - European Quality Assurance Vocational Education and Training) in order to increasingly develop the mobility of workers and for the achievement of skilled labor, hoping that “learning in the workplace, as that foreseen by dual systems, should build the foundation of vocational education and training systems in Europe, with the aim of reducing youth unemployment, facilitating the transition from study to work as well as responding to the requirement of skills in the world of work”. In this case, also the approach based on learning outcomes, which is the foundation of the European Qualifications Framework and the related national frameworks, contributes to this change of perspectives of the training and integration activities in the world of work.

The tools offered through the EQF, the European Credit Transfer System (ECTS and ECVET), the multilingual European classification of skills/competences, qualifications and occupations (ESCO), etc contribute improving transparency, in making the different qualifications comparable.

It is clear that these tools have to be integrated with each other, within a coherent overall framework, expressed through a coordinated offer of the different services concerning transparency and formal recognition of qualifications. Indeed, “the ability to clearly understand and quickly recognize knowledge, skills and competences will contribute to a real European mobility. The creation of a European skills and qualifications referral space will support efforts to achieve transparency and cross-border recognition of formal qualifications acquired in higher-level vocational education”.

With the subsequent 2015 Joint Report of the Council and the Commission on the implementation of the strategic framework for European cooperation in the field of education and training (ET 2020) (2015/C 417/CE), a clear picture of the European reality is presented, in relation to what has been achieved up to that point and the fields remaining under observation with reference to or in strict connection with education and training are identified.

The issues highlighted in this Report are several and not easy to resolve: to restore job creation and economic recovery, achieve sustainable growth, remedy the lack of investments, improve social cohesion, coordinate the response to migration flows, but also adapt to digital age and to the competition in the knowledge-based world economy.

All these problems can find an appropriate solution by looking at the education and training systems, which are considered by the Council as essential tools for the growth not only of the individual but of the whole European society. In fact, “these provide individuals with the knowledge, skills and competences that allow them to grow and influence their own situations by broadening their perspectives, equipping them with what is necessary to succeed in life, laying the foundations for active citizenship and democratic values as well as promoting inclusion, equity and equality”.

The 2015 Communication COM(2015) 408 Final, indicates the challenges that still remain and the new sectors - with concrete issues - that need to be confronted with determination by 2020.
The new priority areas are:

- relevant and highquality skills and competences, focusing on learning outcomes, for employability, innovation and active citizenship
- inclusive education, equality, nondiscrimination and promotion of civic competences
- open and innovative education and training, fully embracing the digital era
- strong support for educators
- transparency and recognition of skills and qualifications to facilitate learning and labour mobility
- sustainable investment, performance and efficiency of education and training systems

Based on the statistical data that states that only 4.4% of the 66 million adults who have at most achieved a lower level training participates in adult education, and that “one adult in four is subject to the trap of poor qualifications, it becomes clear that these low levels of knowledge and basic skills themselves represent a major obstacle to European economic and social progress”. For these reasons, the Communication reaffirms strongly that in addition to increasing the widespread level of basic skills, it is necessary to try to encourage the development of key competences, including: creativity, entrepreneurship, initiative, digital skills, skills in foreign languages, critical thinking, etc.

To achieve all this, “lifelong learning as a lifelong process achieved through an integrated system that favors interactions between different areas of intervention” is a necessity. That higher education systems can thus stimulate the knowledge economy and respond to the needs of society is what is hoped. Modernization, and this should be ensured, would need to focus on synergies between higher level institutions, local and regional context. Also the implementation of innovative approaches, including the use of information and communication technologies (ICT), would need to improve of the relevance of education programs, facilitating the transition to the world of work and strengthening international collaboration.

**The contribution of social dialogue: the experience of the European passport of skills in the tourism sector**

The EESC, European Economic and Social Committee, with its opinion on *The Role and Perspectives of the Social Partners and other civil society organizations in the context of new forms of work* (SOC/561) considers it essential to recognize the role played by the social partners, to confront the major transformations in the digital field as well as in the evolution of the environmental and demographic realities that are investing the European continent. Even while using the training tools, the social partners can undoubtedly offer their own contribution to outline initiatives aimed at building targeted tools and at managing and understanding the new phenomena created by the technological revolution.

In the same direction, in points 4 and 5 of the aforementioned opinion, the EESC strongly supports that among the most important issues of the social dialogue are the ones on employment, students’ and workers’ mobility, the transition from a job to another and lifelong education. These themes, of
course, are linked in an inseparable way to other social issues such as social protections, working conditions, salary, health and safety. In particular, in paragraph 5, the social partners are also given the task of anticipating the quantitative and qualitative developments generated by the digital transition, in order to conform the workers' skills to the needs of the new professions. Precisely the digital skills are seen as an essential element of current and future education, since they are mandatory to any form of adaptation to the changing reality in the world of work and in the society itself.

The 2014 European Skills Passport for the Tourism Sectors (European Hospitality Skills Passport) corresponds to a very important example of the activity carried out by the social partners to facilitate a more sustainable and structural employment growth. The initiative goes back to the work of the Commission in the context of the European social dialogue. In its conception, the European social partners have played a major role in identifying the useful skills in the process of accrediting roles and tasks towards a definitive classification. This has been done according to the scheme produced by the Recommendation of the European Parliament and Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning (2008/ C111/01).

The social sectorial parties that have made their decisive contribution are: the European Trade Union Federation of Agriculture, Food and Tourism workers (EFFAT), the European Confederation of Entrepreneurs in the Hotel and Catering Sectors (HOTREC). The European Skill Passport hosted by EURES, the European professional mobility portal, all available in all official languages of the Union.

To understand the purpose of the initiative, we refer to the European Commission press release of 17 June 2014, which provides the following explanations: “The European Commission has today launched the European Hospitality Skills Passport, a tool developed to facilitate contact between jobseekers and employers in the hospitality and tourism sector in Europe. The Skills Passport allows workers and employers to overcome language barriers and to compare hospitality workers’ skills in order to facilitate recruitment in the sector”. Furthermore, the strategy implemented through this tool is to create a direct relationship between workers and employers concerning the demand and the supply of a job. In fact, “in the Skills Passport, workers can record all the skills and competences gained during their education, training and practical work experience in an easily accessible format. The Passport complements a traditional Curriculum Vitae and enables employers to quickly overcome language barriers and to find the skilled workers they need to fill their vacancies. It therefore facilitates a better match between supply and demand on the hospitality labour market”.

Through the EURES portal, workers can register in a special forum and enter all their skills and competences by selecting them from a list. Each competence has to be supported by real work experience or training, which should easily be confirmed by previous employers and by written certification. The selected skills are automatically translated into the chosen European languages, in order to allow employers to understand exactly their scope in their own language.

At the same time, on the same portal, employers indicate the skills they are looking for, obtaining already a filtered selection of CVs for the specific role they require. For these reasons, the targeted selection of skills and professions induces considerable time saving in the selection of the resources. It also creates a greater choice possibility in a wider labor market that goes beyond the territorial and national boundaries.
The aim is also to encourage and support mobility within the European perimeter promoting increased personal experience, which can result in concrete employment opportunities at every level. Still according to the Commission’s perspectives, “the European passport of skills for tourism is the first of a series of passports dedicated to sectors of the European economy characterized by high mobility. The Commission is committed to supporting mobility on the European labour market as a factor to improve employment and will continue to work with its partners to extend instruments such as the European Skills Passport to other sectors with high mobility in Europe”.

**INDUSTRY 4.0 WORK IN PROGRESS**

While the Knowledge Society is still trying to find its definitive expression in Europe, technology has changed our lifestyles in fast pace in recent times. The ability of the institutions to create suitable tools to adapt to these changes have not proven to be effective as to enable us to keep up with the pace of evolution. Indeed, we can say that today’s revolution introduced by Industry 4.0 can be considered a further form of development of the Knowledge Society, emanating from it, but certainly not its conclusion.

From this point of view, the perspective opened by Industry 4.0 in terms of accelerating the possibilities of changing the design, production, marketing and value generation of products and related services is already a well-established reality. The consequences of this are already observed today, even if the arising social implications are not entirely palpable yet.

According to the vision of the European Commission, the creation of a single digital market is an indispensable prerequisite to draw investments in digital innovations. Already in 2015 the European Commission had launched the Strategic Framework 2020 to outline a coordination strategy in which the public-private partnerships (PPP) should have formed the aggregation structures of important digital industrial contexts.

In 2016, the Commission repeatedly emphasized the importance of digital development in Europe through the Communication COM (2016) 180 Final on The Digitization of European industry. Take full advantage of a digital market on April 19, 2016. Beyond the actions carried out to support the investment of digitization and the development of ICT, it is important to underline how the theme of skills development as well as that of education and training activities related to the acquisition of digital competences are absolutely considered a priority.

Starting from the observation that about 40% of EU workers do not have digital skills, the first problem that arises, concerns the increasing gap between the supply and the demand of workers with digital skills. In fact, more and more work in the digitized economy will require specific skills and abilities, correlated to attitudes promoting creativity, adaptability and good communication practices.

In chapter 4.4 of the Communication on Human Capital ready for digital transformation with the necessary skills, the Commission expresses the need to establish a broad dialogue on the social aspects of globalization, as well as on those of work, education and training.

The important aspect in this chapter is the recognition by the European social partners that digitization involves elements that significantly impact not only the technological innovations, but also greatly impact social, labor and economic values, etc. This is why the
Commission considers that a dialogue on social issues with the social partners in relation to development issues and digitization is essential to ensure that social aspects are taken into due consideration. As for the qualifications, in addition to the digital ones, complementary ones, such as those related to entrepreneurial spirit, leadership and engineering skills in addition to the linguistic ones are assets to be developed. In fact, it is expected that the new jobs of the future will require a right combination of basic, transversal and technical skills in support of the digital and entrepreneurial abilities. The education and training systems are not currently expressing such an orientation.

In this case, the industry can play an active role in defining and acquiring the skills and abilities considered as basic. The Commission, together with the world of industry, in agreement with the social partners and the providers of education and training, will engage a close dialogue with these stakeholders in order to outline possible scenarios related to the potential impact of Industry 4.0. In fact, in conclusion of the quoted document, the Commission itself outlines the next steps considered as essential to face future challenges: strengthening of the role of industry and partnership with research institutions; development of digital skills also in the context of Horizon 2020 and incentives for partnerships; involvement of small and medium-sized enterprises in the process of digitization.

The Opinion of the EESC, European Economic and Social Committee, on the topic of Industry 4.0 and the digital transformation; the direction to follow (2016/C 389/07), in the Communication on Digitization of the European industry, goes in the same direction mentioned previously. Among the most relevant observations made by the EESC refers to managing technology with all its social implications as being one of the great challenges of our time. In such a way, many European citizens without the capacity to adapt to the rapid acceleration of technology could prevent from being marginalized. Collaboration and the establishment of a constructive dialogue is proposed between the whole business sector, trade unions, non-profit organisations as well as the public sector, various sectorial organisations, politicians and society in general.

As far as skills are concerned, in this case also, the central role played by education at all levels and by training programs across the whole Europe is recognized. An updating is urgent which means to implement digital skills and qualifications along the traditional ones, while supporting the need for international mobility and flexibility. To optimize this process, the level of public and private investment will have to rise, mostly to equip the EU workforce with the necessary digital skills. In this case the EESC needs to intervene on the flexibility factor, as a way to promote a harmonization between personal responsibilities and freedoms in the adjustment to the new lifestyle. In point 6.10 it is recommended that, in order to create a proper balance between the interests of workers and those of employers, different forms of flexibility should be applied by the national social partners on the basis of established practices or national laws. The social dialogue at European level should allow a new approach and at the same time ensure that the workforce is well educated and motivated, being able to count on a decent income and quality work.

Furthermore, according to the EESC, the Social Dialogue in the Industry 4.0 at the EU level should concern: 1) analysis of economic and social complexities, and anticipation of change at sectoral level, promoting a shared understanding; 2) mapping consequences for
various segments; 3) transformations in employer-employee relationships; 4) occupational health and safety liability, given automated and connected machines and vehicles; 5) job descriptions; 6) ‘flexicurity’ and mobility due to further fragmentation of value chains; 7) skills and qualifications focused on the needs of digital technology users, and reskilling are therefore key issues; 8) education and schooling, from primary school to university; 9) continuous re- and upgrading of skills; 10) attention to gender balance; 11) best practices; 12) mobility (Schengen); 13) communication and information.

In further study on these issues, the EESC offers its Opinion on Providing and developing skills, including the digital ones, in the context of new forms of work: new policies and the evolution of roles and responsibilities (SOC/56). In this document, the EESC considers necessary to act now, in a structured manner, to ensure that in the future there will be adequate skills to enable European citizens to keep up with the pace of evolution, without running the risk of remaining isolated in today’s society. For what concerns work itself, majors changes at the individual level are induced by the development of internet networks and the availability of broadband. Forms of atypical work, in which for example workers offer their specialized professional services to many contractors, correspond to a new reality.

This is the phenomenon of crowdworking, corresponding to workers who offer their work with great flexibility on internet platforms, without benefiting from the social protection offered to other types of work (flexicurity). Although the debate is open to offer the crowdworker a system of guarantees that could also protect all forms of atypical work, one must consider that in fact these collaborators are becoming more and more important in the development of digital companies as well as in the traditional ones. This is self-employment (digital nomads), with partial and multiple contracts, normally involving several contractors. This work reality presents many risks and few social security measures.

The impact of automation and the robots will be significant, improving some aspects of the traditional work considered dangerous or repetitive, adding an important increase of productivity. This will bring about profound changes in many sectors of works, even those non specifically digital. Here we refer to culture, art, tourism, social assistance, health assistance, but most of all communication in which the digital and robotic component is emerging in an ever more conspicuous form as to replace old skills.

As for the new skills and competences, these will be a necessary prerequisite to get the best out of the digital age, not just for atypical workers but for all citizens of the Union. The technical and social skills, together with the entrepreneurial ones, represent an important step in the construction of the digital society, together with the lifelong learning ability. In particular, at the individual level, the non-new vision of continuity between formal, non-formal and informal learning is reaffirmed. In this case the technology as well as the digital and IT tools can make a substantial contribution to the creation of opportunities for continuous professional updating and education, as to reduce differences in results and access to education.

From an educational point of view, to improve learning experiences and results, the learner must therefore be placed at the center of the educational system. The individual must in fact be able to manage personally his own path of learning, training and retraining. In this way, the learners having the real possibility of becoming active and digital citizens, will have to
be able to contribute to the value of their acquired knowledge by controlling the nature, the place, the rhythm, the timing of learning all this in line with their opinions and their values, in a spirit of solidarity and respect for differences that represent part of Europe’s identity.

Referring to the point 4.5 of the Opinion, “learners need to be guided towards innovative practices of knowledge creation, which implies the merging of social, physical, digital, virtual and mobile spaces for learning, and to learn how to learn. Inquiry and project-based learning, phenomenon-based learning, student-activating activities, collaborative learning and flipped learning, for example, all lead to more reflective and participatory learning processes. One possible way to narrow or eliminate gaps between innovation in technology and pedagogy is to link formal, non-formal and informal learning structures more effectively”.

A final aspect worthy of mention is the need to rethink the role of teaching considering the contribution offered by technological tools. The task of educators and teachers will be increasingly complex and delicate, and their training will also have to adapt to the new demands of the Knowledge Society and of the era of digitization. This should include new approaches with learners. For what concerns the transmission of information and knowledge through technological devices and aids, the new didactic contexts provide a qualitative preparation able to generate added value in the management of methodologies and in the use of teaching flexibility. In fact, it is necessary to extend this methodological flexibility from formative contexts to non-formal ones, to allow the unfolding of the contributions offered by the learners’ individual experience and consolidate its value. Through support to non-formal education providers, it is possible to valorize competences otherwise excluded from formal education, in order to reach disadvantaged groups and offer them access to lifelong learning opportunities. This new teaching and learning approach implies new evaluation methods, also offered by digital technologies. The possibility of integrating traditional evaluation approaches with those offered by artificial intelligence and machine intelligence are increased, with the possibility of measuring learning through the structured systems of the new teaching material itself. In fact, the use of technologies allows to optimize a more personalized learning, as the use of analytical technologies enables faster and more effective feedback.

At all levels of education and training, therefore, creating systems to promote skills and abilities as an urgent need to adapt to new developments imposed by the fourth industrial revolution has to be addressed. We need to define the roles of the various levels of formal education, promoting a substantial link between them, and fostering creativity and imagination. At preschool level, it is necessary to combine creativity with sound basic knowledge, to foster critical thinking and adaptation of knowledge. At the scholastic level, it is necessary to achieve specialized interdisciplinary skills and to support vocational education and training. At the entreprise level, employee training should be understood as a suitable mean to increase the workforce and to contribute to the benefit of the company and the society in which it is incorporated. When we reach the research sector at university level, it is noted that huge quantities of scientific data need to be dealt with. It leads us to envisage the possibility of information exchange at all levels (national and international), but above all to create forms of coordination and infrastructures designed for this purpose.
As is widely known, “digitization is a paradigm shift that is affecting HE profoundly in terms of teaching and (blended ) learning, teachers’ and students’ skills, and governance structures. More dynamism and flexibility will be required at all levels. In this regard, closer cooperation between HE and the private sector is also beneficial, if not essential”.

These words originate from the point 5.13 of the Opinion of the EESC Engaged universities shaping Europe. The theme of the transformation of universities and higher education represents a very important aspect for the European institutions as a whole, as they are rightly considered the pivot on which the development of the continent revolves. The technologies have had a considerable impact on teaching and research activities and the EU’s interventions for the development of the European Higher Education Area (EHEA) and the European Research Area (ERA) have shown a great attention aimed at creating high-level training management tools. For example, the renewed Lisbon Strategy in 2005 gave also rise to new initiatives to mobilise universities. The Council’s decisions to establish the European Research Council (ERC, 2007), and the European Institute of Technology and Innovation (EIT, 2008) are most important. In the same vein is the Green Paper The European Research Area: New Perspectives. In addition, many other initiatives have been produced to evaluate and intensify efforts to equip universities and other educational institutions with concrete tools for comparing the different educational realities, with the aim of promoting transparency and comparing statistical data, including through the use of social networks. In fact, comparability and transparency should foster competition and convergence in terms of performance. Transparency tools such as U-Multirank in the EU have great potential and universities need to consider how to use this type of instrument more effectively. U-Multirank is a new multidimensional, user-driven approach to international ranking of higher education institutions. U-Multirank (https://www.umultirank.org) compares the performances of higher education institutions – in short: universities – in the five broad dimensions of university activity: (1) teaching and learning (2) research (3) knowledge transfer (4) international orientation and (5) regional engagement. The U-Multirank web tool enables comparisons at the level of the university as a whole and at the level of specific fields of study. Based on empirical data U-Multirank compares institutions with similar institutional profiles (‘like-with-like’) and allows users to develop their own personalized rankings by selecting indicators in terms of their own preferences.

Another tool to be highlighted, proposed by the European Commission is HEinnovate (www.heinnovate.eu). HEinnovate is intended for higher education institutions (Universities, University Colleges, Polytechnics etc) who are interested in assessing themselves against a number of statements related to the entrepreneurial and innovative nature of their higher education environment. It is an initiative of the European Commission, DG Education and Culture and the OECD LEED Forum, and supported by a panel of six independent experts. HEinnovate is a free self-assessment tool for all types of higher education institution. It allows you to assess your institution using a number of statements related to its entrepreneurial activities, including leadership, staffing and links with business. Extensive training and support materials, including practical case studies, are available to support workshops and further development within your institution.
On the topic of comparison between higher education institutions, it is important to underline the contribution offered by the European University Association (EUA). The University Autonomy Tool lets you compare university autonomy in 29 higher education systems. It provides detailed information on organizational, financial, staffing and academic autonomy and ranks countries according to the level of autonomy they have in each of these dimensions. In this perspective it is important to mention the research *University Autonomy in Europe III: The Scorecard 2017 (comparative report)*.

The digital tools mentioned are very important to understand how the world of research and Universities now live in a globalized dimension, where the value chain of education and training is open to all operators of the civil society, through forms of data sharing and of teaching practices, and where digital tools represent the most suitable and fastest way to exchange information.

This global dimension of the University, which opens to civil society as a whole, is called Civic University, but other models coexist namely the ‘triple helix’ model - which involve cooperation between universities, the private sector, government - and the ‘quadruple helix’ model, which also engages local communities and civil society.

**CONCLUSION**

In the light of this presentation, it appears essential for the EU to meet the challenges posed by the fourth industrial revolution, in an integrated way as well as with a multidisciplinary and multidimensional perspective. The effects of technology and the digital industrialization do not concern only a few insiders. Their consequences impact the world society in terms not yet completely understandable. Through the social dialogue *tout court*, the institutions at all levels, together with the various productive sectors, the social partners, the higher education institutions, the professional associations, and the citizens’ associations will need to collaborate to avoid the accentuation of any gap between those who benefit from a good integration and those identified as excluded from the system. The higher education institutions and the European universities, in opening to civil society, will increasingly play a strategic role in the formation of the citizens of today and tomorrow.

For all these reasons, social dialogue, education and training, development of competence and skills, social inclusion and protections for the disadvantaged are just some of the key words crucial in defining a sustainable development of contemporary European society.
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