TECHNICAL UNIVERSITY OF CLUJ-NAPOCA

ACTA TECHNICA NAPOCENSIS

Series: Applied Mathematics, Mechanics, and Engineering
Vol. 65, Issue Special III, November, 2022

THE FUTURE OF JOBS AND LIFELONG LEARNING IMPLEMENTATION

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Abstract: *Developing and enhancing human skills and capabilities through education, learning, and meaningful work are key drivers of economic success, individual well-being, and societal cohesion. The past two years have seen a clear acceleration in the adoption of new technologies among companies. A particular focus for elaborating on this paper was the better understanding of how the workforce will respond to the new challenges and opportunities that the fourth industrial revolution requires to form the market, and how the working population adapts to learn new skills.*
Key words: *Future of jobs, Education, Industry 4.0, Lifelong learning, Labor market, Human resource.*

1. INTRODUCTION

Developing and enhancing human skills and capabilities through education, learning, and meaningful work are key drivers of economic success, individual well-being, and societal cohesion. The global shift to a future of work is defined by an ever-expanding cohort of new technologies, by new sectors and markets, by global economic systems that are more interconnected than at any other point in history, and by information that travels fast and spreads wide. Yet the past decade of technological advancement has also brought about the looming possibility of mass job displacement, untenable skills shortages, and a competing claim to the unique nature of human intelligence now challenged by artificial intelligence [1, 2]. The coming decade will require purposeful leadership to arrive at a future of work that fulfills human potential and creates broadly shared prosperity [3].

Over the past decade, a set of ground-breaking, emerging technologies has signaled the start of the Fourth Industrial Revolution. To capture the opportunities created by these technologies, many companies across the private sector have embarked on a reorientation of their strategic direction [1]. By 2025, the capabilities of machines and algorithms will be more broadly employed than in previous years, and the work hours performed by machines will match the time spent working by human beings. The augmentation of work will disrupt the employment prospects of workers across a broad range of industries and geographies. New data from the Future of Jobs suggests that on average 15% of a company's workforce is at risk of disruption in the horizon up to 2025, and on average 6% of workers are expected to be fully displaced [2, 3].

This paper presents the problems that in the midterm, job restructuration will most likely be offset by job growth in the "jobs of tomorrow". Increasing demand for workers who can fill green economy jobs, as well as new roles in engineering, cloud computing, and products development, this set of emerging professions reflects the continuing importance of human interaction in the new economy, with increasing demand for care economy jobs, roles in marketing, sales, and into industrial productions, as well as roles at the forefront of people and culture [2]. Employers who can answer to the "Future of Jobs Challenge" are motivated to support workers who are displaced from their current job roles and plan to transition; therefore, up to 46% of those workers will be trained for new skills, and they will make the transition from their current jobs into emerging

opportunities. In addition, companies are looking to provide reskilling and upskilling opportunities to the majority of their staff (73%) cognizant of the fact that, by 2025, 44% of the skills that employees will need to perform their roles effectively will change [1, 2].

2. FUTURE OF JOBS

Over centuries, technological, social, and political transformations have shaped economies and the capacity of individuals to make a living. The first and second Industrial Revolutions displaced trades that had thrived on older technologies and gave rise to new machines, new ways of work, and new demand for skill sets that could harness the power of steam, coal, and factory production. The transformation of production has consequently given rise to new professions and new ways of working that eventually paved the path to greater prosperity despite initial job displacement among individuals [1, 2].

2.1 Technological adoption

The Future of Jobs shows that companies expect to restructure their workforce in response to new technologies. In particular, it is indicated that they are also looking to transform the composition of their value chain (55%), introduce further automation, reduce the current workforce (43%) or expand their workforce as a result of deeper technological integration (34%), and expand their use of contractors for task specialized work (41%) [1].

The past two years have seen a clear acceleration in the adoption of new technologies among the companies. A selection of technologies organized according to companies likely to adopt them by 2025 [1], are cloud computing, big data, and e-commerce remain high priorities, following a trend established in previous years. However, there has also been a significant rise in interest in data encryption, reflecting the new vulnerabilities of our digital age, and a significant increase in the number of firms expecting to adopt nonhumanoid robots and artificial intelligence, both technologies slowly becoming a central component of work across productions industries [1].

These new technologies are set to drive future growth across industries, as well as to increase the demand for new job roles and skillsets. Such positive effects may be counter-balanced by workforce disruptions. It is observed that technological adoption will impact workers jobs by displacing some tasks performed by humans into the realm of work performed by machines. The extent of disruption will vary depending on a worker's occupation and skillset [2].

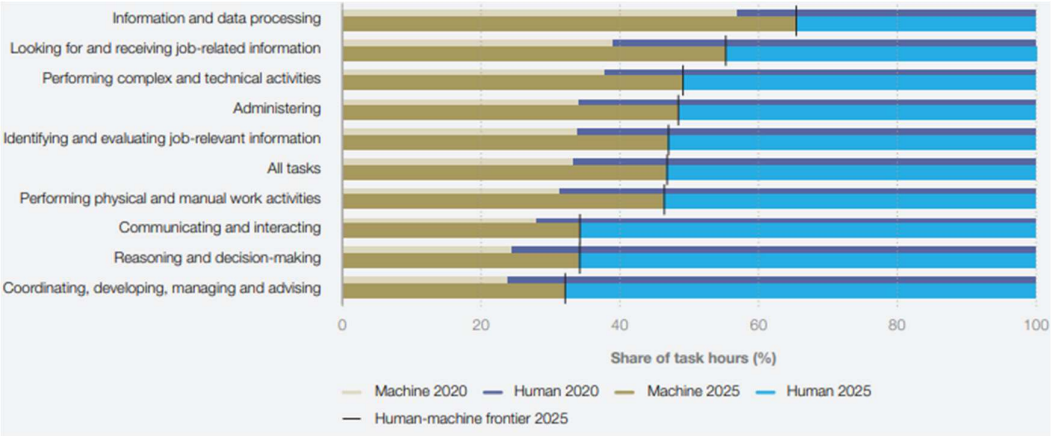

Fig. 1. The reallocation of current tasks between humans and machines [1].

The reallocation of current tasks between humans and machines is already in motion. Figure 1 presents the share of current tasks at work performed by humans vs. machines in 2020 and forecasted for 2025 according to the estimates and planning [3]. The tasks where humans are expected to retain their comparative advantage include managing, advising, decision-making, reasoning, communicating, and interacting [1].

2.2 Emerging and declining jobs

Employers expect that by 2025, increasingly redundant roles will decline from being 15.4% of the workforce to 9% (6.4% decline) and that emerging professions will grow from 7.8% to 13.5% (5.7% growth) of the total employee base of the company [1].

Based on those numbers, is estimated that by 2025, 85 million jobs may be displaced by a shift in the division of labor between humans and machines, while 97 million new roles may emerge that are more adapted to the new division of labor between humans, machines, and algorithms, across the industry and economy. [3]

The leading positions in growing demand are roles such as data analysts and scientists, AI and machine learning specialists, robotics engineer software and application developers as well as digital transformation specialists. however, job roles such as process automation specialists, information security analysts, and internet of things specialists are newly emerging among a cohort of roles that are seeing growing demand from employers. The emergence of these roles reflects the acceleration of automation as well as the resurgence of cybersecurity risks [1].

At the opposite end of the scale, the roles which are set to be increasingly redundant by 2025 remain largely consistent with the job roles which are being displaced by new technologies: data entry clerks, administrative and executive secretaries accounting and bookkeeping and payroll clerks, accountant and auditors, assembly, and factory workers, as well as business services and administrative managers.

In the job family of source occupation, only 19% and 26% of job transitions into engineering and people and culture, respectively, come from outside the job family in which those roles are today. In contrast, 72% of data and AI-bound transitions originate from a different job family, and 68% of transitions into emerging jobs within sales. [3] As illustrated in fig. 2 emerging job clusters are typically staffed by workers starting in a set of distinctive job families, but the diversity of those source job families varies by emerging profession. While emerging roles in product development draw professionals from a range of job families, emerging roles in the people and culture job cluster typically transition from the human resources job family. The emerging cloud computing job cluster is primarily populated by professionals transitioning from IT and engineering [1, 4].

Figure 2 demonstrates that the newer emerging professions such as data and AI, product development, and cloud computing present more opportunities to break into these frontier fields, and that, in fact, such transitions do not require a full skill match between the source and destination occupation. [1] However, some job clusters of tomorrow remain more “closed” and tend to recruit staff with a very specific skill set. It is not possible to observe whether those limitations are necessary or simply established practice. It may be the case that such “siloed” professional clusters can be reinvigorated by experimentation with relaxing the constraints for entry into some emerging jobs alongside appropriate reskilling and upskilling.

3. EDUCATION

One of the principles of the social right in society is to ensure that everyone has the right to quality and inclusive education, in order to maintain and acquire skills that enable them to participate fully in the labor market. A higher level of education is desirable so that everyone has the opportunity to participate in economic and social life, by reducing the risk of falling into poverty or social exclusion [5].

One of the differences in the national education systems vary from each state in terms of structure and curricular content, it can be cult to make spatial or temporal comparisons when assessing the performance [5].

To manage and interpret the inputs, processes, and outcomes of education systems, official statistics on education are compiled according to the international standard classification in education (ISCED). The term tertiary education refers to an aggregate composed of ISCED levels 5-8 [5].

3.1 Vocational education

In recent years, the education market has shown a growing interest in the type of vocational education, that have the potential of

helping and facilitating the transition of young people from education in the labour market, especially when such programmes are designed that the student acquires competencies, knowledge, and skills that are required by employers [6, 7].

At the age of 17-18 students are typically finish high school that representing the upper secondary education level (ISECD level 3). In general, these programmes are designed to prepare students for the next step (the tertiary education level) or for the labour market whit a relevant set of skills. In 2016 in EU has 10.8

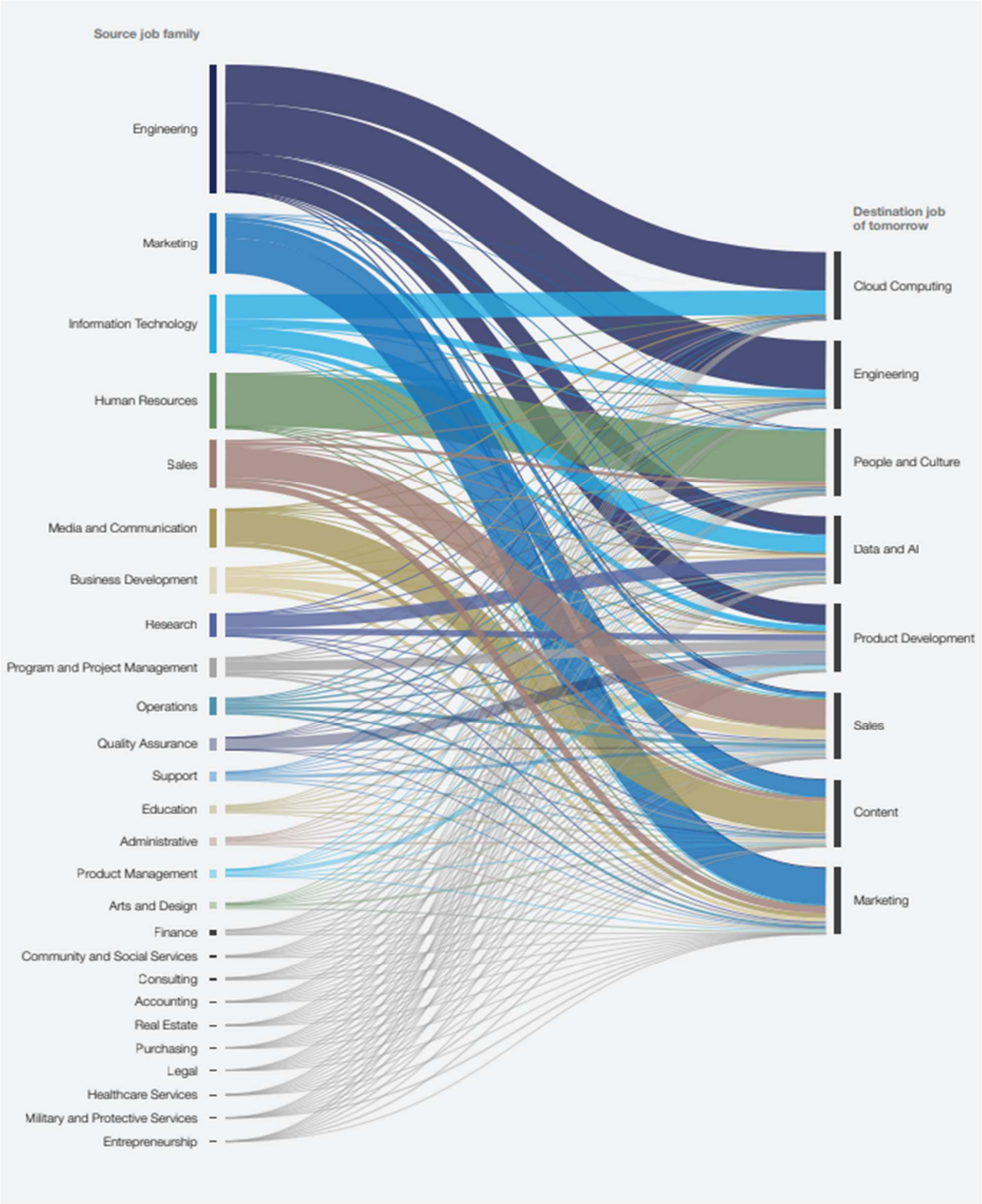

Fig. 2. Emerging jobs [1].

million students that are enrolled in vocational education programmes, equivalent to 49.3% of the total number, the remaining 50.7% participated in general upper secondary education programmes that were more academic in nature [5] [7].

The proportion of upper secondary students participating in vocational education programs varied considerably across different regions of the EU. These differences can be attributed to the perception of the local authorities concerning vocational education and training, for example, in Czechia, the Netherlands, and Austria, this type of education is widely seen as an efficient way to help young people transit to the labor market. [8] In 2017, there were 24 regions of UE where more than 7 out of 10 students that are in upper secondary education are in vocational education, this includes seven out of eight regions of Czechia, whit the highest rate in Severozapad (76.7%); six regions from the Netherlands and five regions from Austria [5]

By contrast, in relation to the total number of students following upper secondary education, the number following vocational educations programs was generally quite low in capital city regions, reflecting the concentration of academic establishments in these cities [4].

Indeed, less than one-quarter of all upper secondary students followed vocational programmes in:

- The north-western Hungarian region of Közép-Dunántúl (24%);
- Two regions from Greece, the mainland region of Peloponnisos (24.8%) and the capital city region of Attiki (23.4%);
- Cyprus, which had the lowest share in the EU (16.7%; national data at this level of detail).

3.2 Tertiary education

Tertiary education (ISCED levels 5-8) is at the top of the education pyramid and is the next step after secondary education providing learning activities at a higher level of complexity; it is offered by the universities, vocational establishments, institutes of technology, as well as other institutions awarding academic degrees and/or professional certifications. There is a range of needed changes to respond to the present challenges for tertiary education like increasing participation (especially among disadvantaged groups or different regions of the EU), reducing drop-out rates, and reorganizing the time that takes some individuals to complete their courses, review degree courses more relevant for the modern workplace, those challenges are not only for the tertiary education but also to the vocation education [6]. These challenges can be easily so in the evolution of jobs specialization that appears on the market that will need to develop/learn a new set of skills during the course of their working lives in order to safeguard their employability [7].

For analyzing the results of tertiary education in the EU, the focus group will be the population aged between 30-34 years that have successfully completed this level, this age group has been used as it is commonplace for most students to have completed their tertiary education during their twenties (even if they followed masters or postgraduate courses). This indicator forms part of a scoreboard used to monitor the European pillar of social rights, while it is also an ET 2020 benchmark and a Europe 2020 target; for the latter two cases, the policy goal is to increase tertiary educational attainment in the EU, so that it reaches at least 40%.

In 2018 the target of the Europe 2020 benchmark is achieved whit an average of 40.7% of the population aged between 30-34 years possessing a tertiary level of education. The tertiary educational attainment among people aged 30-34 years rose by 9.6 % between 2008 and 2018. Although the target is achieved there are huge discrepancies between different regions of the EU, whit the lowers range in Romania at 24.6% and Italy at 27.8%, on the other side Sweden (52%), Luxembourg (56.2%), Ireland (56.3%) Cyprus (57.1%) and Lithuania (57,6%) with more the half of the population that has completed tertiary education [7].

In the map shown in figure 3 is easy to observe that in the capital city regions and where are established big universities appear to act as a magnet for large organizations and as result attract highly qualified people not only from the region but from other regions. This attraction to big cities has the potential to generate labor

market imbalances as a growing number of people whit tertiary education move to these cities regions, while people with relatively low salaries are driven out (due to the cost of life) and to other regions the workforce to have major difficulties to find people whit highly qualified. This attraction of the big cities may also result in some other problems like some graduates (in general temporarily) accepting jobs for which are over-qualified.

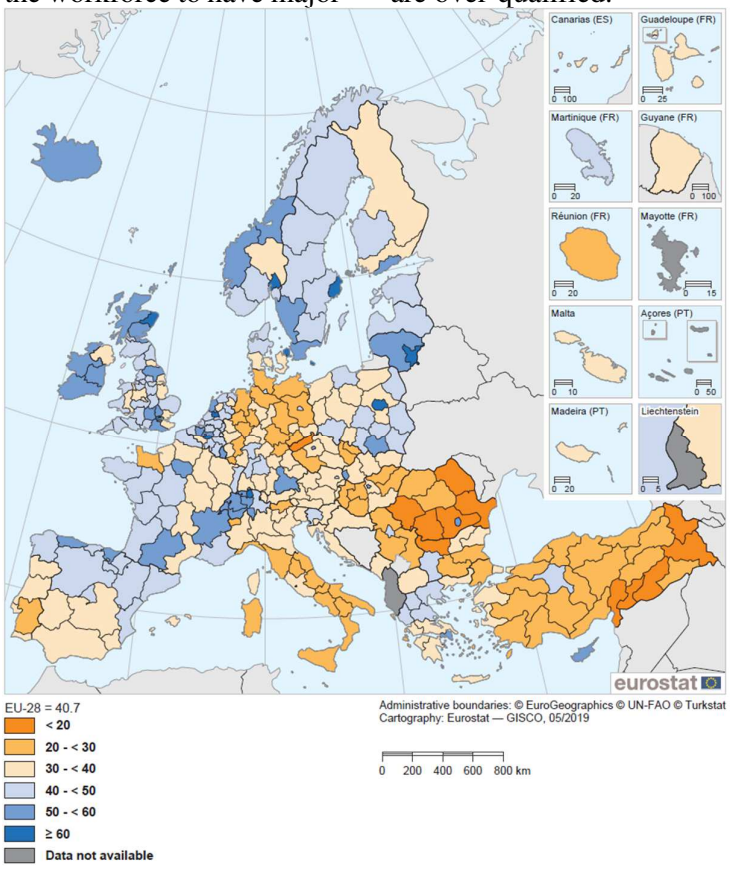

Fig. 3. Tertiary education [7].

This pattern is easily observed that in recent years a signifiable number of young graduates migrate to big European cities in search of work and a certain lifestyle [7, 8].

In 2018, there were 10 regions (in capital cities regions) where more than three-fifths of the population aged between 30-34 years had a tertiary level of educational attainment (shown in the map whit the darkest shade of blue color). By contrast, in more the half of the UE regions the level of education is lower (shown in the map whit the yellow and orange shades) due to the economic sector in these regions, and because of the migrations of the high qualified force to the big cities [7].

4. REGIONAL EMPLOYMENT

The employment rate is the ratio of the employed person at a given age relative to the total number of populations at the same age, in this part are presented information for the working-age population, defined as people aged between 20-64 years, the definition used is on them according to whit the Europe 2020 strategy [6, 7].

The Europe 2020 strategy set the target to grow the number of jobs by which 75% of people aged 20-64 years should work. For this goal, the EU set national targets for each of the Member States depending on the economical stage of each member and the range of 80% or higher in Denmark, the Netherlands, and Sweden and below 70% in Ireland, Croatia, Italy, Malta Greece, and Romania, there are not target in the rest of the states [7, 9].

There were 232 million people employed in 2016 in the EU Member States, the statistical classification of economic activities in the European Community can be used to identify

literally hundreds of different economic activities, however, these have been aggregated into just six different groups (Fig. 4). The total number of persons employed in the EU is divided as follows:

- Agriculture, forestry, and fishing (10.4 million people employed; 4.5% of the EU total);
- Industry (35.6 million; 15.3%).
- Construction (14.7 million; 6.3%).
- Wholesale and retail trade; transport; accommodation and food service activities; information and communication (64.4 million; 27.7%)
- Financial and insurance; real estate; professional, scientific, and technical; administrative and support service activities (38.1 million; 16.4%).
- Public administration - defense; social security; education; health and social work - arts, entertainment, and recreation; others (69.1 million; 29.7%) [7].

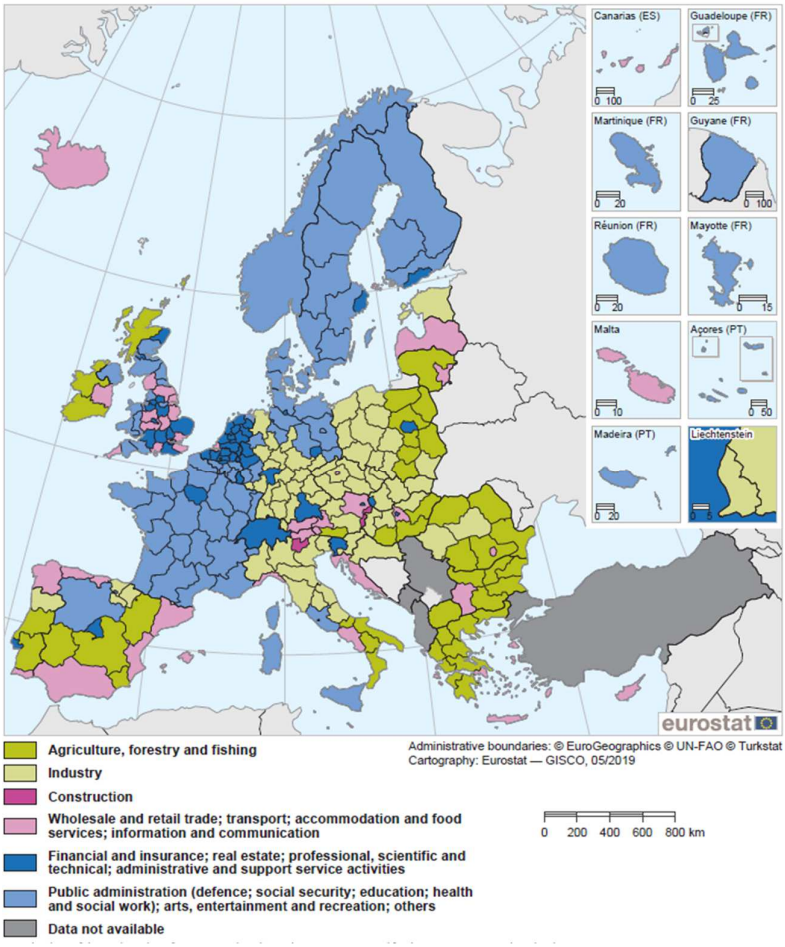

Fig. 4. Employment specification, 2016 [7].

In the EU many reasons can explain the concentration and distribution of the economic activities, one of the reasons is the natural resource endowments may some regions have activities specialization such as mining or forestry. From a similar point of view, the climate, location, or landscape can help explain why other regions can be specialized in agriculture or tourism. Another economic activity, whit labor that has skilled specializations, can be explained by the location are localized, for example, research parks tend to develop near towns with big universities, whereas financial, communications, and media are often concerted in capital city regions [4, 7].

The map from figure 4 shows which of the six activities had the highest employment specialization in the regions of the EU. Note that the map does not necessarily indicate the activity

with the biggest workforce, rather, it shows the activity whit the highest share of the workforce of the region [7].

In 2016, the highest employment specialization indices were systematically recorded for the primary activity such as agriculture, forestry, and fishing, it is easily seen in the employment rate in the eastern and southern parts of the EU, with 27 different regions reporting the majority workforce employed in the agriculture, forestry and fishing activities. In these regions, the employment workforce in this activity was at least three times higher than the EU average of 4.5%, those regions including five out of six regions in Bulgaria, 8 out of 13 in Greece, six regions in Poland, and 5 out of 8 in Romania. The rest of the regions where this activity is predominant area in the south of Italy whit 3 regions, in the center of Spain whit 4 regions, the south of Portugal, and in the east of the UK, but these regions are known for having a tradition in this area of activity [4, 7].

In the west region of Romania, the total number of employed is whit 2.7 times higher than the de EU average in the field of industrial activity [9]. This can be explained by the proximity of the western market, a skilled and multilingual workforce due to the universities that are in the region, as well as the direct investment in the field of electronics, IT, machinery, and the automotive industry. The second highest employment specialization indices of industry activity were recorded in four different regions in the north of Czechia, there are characterized by two different patterns: first is the continued investment in the heavy and traditional industries, such as coal, iron and steel, chemicals, textiles or glass, and the second is the investment in other industrial activities such as electronics, pharmaceutics and transport equipment [7, 9].

In general, the highest employment specialization indices for construction were recorded in the French islands, followed by regions located around big cities, that need new buildings for economic activity and living.

In the group of services, the highest employment specialization indices for wholesale and retail trade, transport, accommodation, and food service, information, and communication were recorded in general in the regions known as being holidays or tourist destinations, namely in Greece regions like Aigaio, Ionia, Nisia and Kriti, in Spain are the islands that are known as tourist attraction Canarias and Illes Baleares and in Portugal the region of Algarve [3, 7].

The fifth group of economic activities in that the EU Member States are classified is the financial and insurance, real estate, professional, scientific and technical, administrative, and support service activities, and the highest employment rate is in the region around the capitals cities and the zones, where are big universities and research centers [7].

Finally, the highest employment specialization indices for public administration, arts, entertainment, and recreation; others were recorded either in relatively remote regions (where there may be few alternative employment opportunities) that included the Spanish autonomous cities, the outermost regions of France, and the Portuguese Região Autónoma dos Açores, or in the EU Member States that are characterized by relatively high levels of public sector spending, for example, Belgium (particularly in the south), Denmark, France, and Sweden [4, 7].

5. SOCIOECONOMIC DEMOGRAPHIC

Population changes are driven by natural populations change and the net migration of people. Therefore, it is a different wide range of reasons for demographic change in the EU, with a large range of reasons for this, some of the most common reasons in medium-term evolutions may be summarized as follows:

- The effect of capital cities, the attraction of population in the regions of capital cities or big cities, is associated with education and/or employment opportunities conduct to a migration of population (national and international);
- Urban and rural split, were in majority of urban regions continuing to report population growth, while the number of people resident in many rural and postindustrial regions declines;
- Regional divergences within the individual EU Member States which may impact

regional competitiveness and cohesion, for example, between the eastern and the western regions of Germany, or between northern and southern regions of Belgium, and Italy [7].

In 2018 the population of the EU was increased whit 2,4%, from 2008 from 500 million to 512 million, but one-third of the regions of the EU recorded a lower population in 2018 than in 2008 [4]. The EU Member states where are reported a decrease the population to a least half of the regions are:

- Bulgaria, Estonia, Croatia, Latvia, and Lithuania, where all regions reported a decline in population number;
- Hungary and Romania, where all the regions except the capital city region reported decreasing population;
- Greece, Poland, and Portugal, where most of the regions followed this pattern.

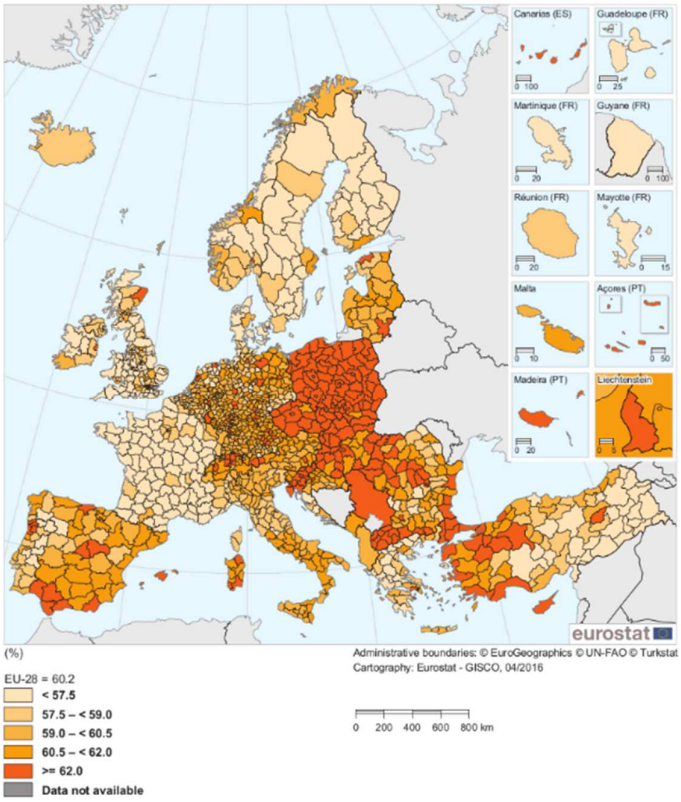

Fig. 5. Working age population [7]

The relative size of the working age population The map shown below focuses on the working-age, in this case using a slight age interval range, from 20-64 years, in this age range some people, particularly younger ones may still be in the education systems and so they are not in the workforce and there is a group of young people that start they carrier before the age of 20 years, equally in the opposed part are the people outside of this interval range and they still work [7]. The share of the working-age people in the active population is influenced by many factors, one of these factors is the demography of the region [4].

6. LIFELONG LEARNING IN EU

During a person working life, it is increasingly necessary to develop existing and learn new skills that are relevant to a specific job, or which provide opportunities for new career paths [8]. Continuously refreshing the skills and knowledge of the labor force by means of lifelong learning has frequently been highlighted in Europe Union policies. In the "Education and training 2010" programmers and the European employment strategy is reflected the highlights of lifelong learning which put the accent on the need for strategies to keep human workers in a continuously adaptable.

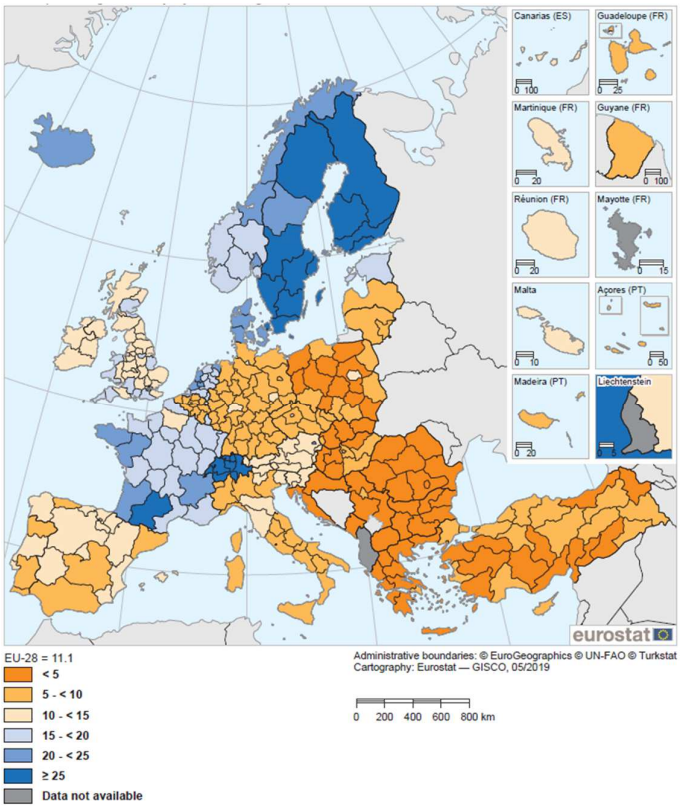

Fig.6. Lifelong learning 2019 [7]

Adult learning can be measured in the Labor Force Survey by specific questions on participation in education or training activities during the four weeks preceding the survey. The target group for this study concern the human workers between 25-64 of age from all education or vocational training, whether or not relevant to participants' current or future employment [5].

On the opposite end, the adult participation rate in learning was below 5% in the EU Member States like Greece, Slovakia, Croatia, Bulgaria, Romania, the last of these have the negative record of the lowest participation rate of only 0.9% [7].

7. CONCLUSION

The new labor market that has taken into shape in recent years since starting the implementation of the fourth industrial revolution presents a lot of challenges and opportunities. As companies begin to implement the strategies of the new industrial revolution, the workforce has a short period of time to evolve and adapt to new job requirements, such as new technologies, including automatization systems, to increase economic value creation through new activities, to improve the job quality in traditional and new emerging occupations and to increase their skills to reach their full potential to perform new work tasks with high added value.

A particular focus for elaborating this paper was the better understanding of how the workforce will respond to the new challenges and opportunities that the fourth industrial revolution requires to form the market, and how the working population adapts to learn new skills. For this, we start by analyzing the regional employment rate of the UE, after that the education rate, starting from de vocation education system that in theory will generate the great mass of the labor force, and finishing whit the tertiary education that generates the labor that will be implementing the new requests and challenges of the fourth industrial revolution, and we finish whit the demographic analysis of the working-age population of the EU. For better understanding, we analyzed the request of the future jobs, and how the EU reacts to the new

challenges by introducing new programmers and strategies for lifelong learning.

Is easily to observe that by implementing the Industry 4.0 requests, the rate of automation machinery will be increasing by approximate 20% by 2025, this aspect will lead the workforce from the industrial field to will have the ability to acquire new skills like analytical thinking and innovation, emotional intelligence, complex problem-solving, system analysis and evaluation. For acquiring those skills, the World Economic Forum estimates that everyone in the industry needs a minimum of extra 101 days of learning.

The target of least 15%, imposed by the EU for 2020, for the active population of all the EU Members State to participate into the lifelong learning programs, that will help the workforce to adapt easily to the Industry 4.0 requests it is not reach and cannot be achieved in all the regions, for many years to come.

An active cause is represented by the migration highly certificated workforce, who have or want to have a high level of educated, this group of people migrates to the capitals regions or regions where prestigious universities are located and where in most cases successful companies have established their headquarters. This group of people has the habituated to participate in different programs for personal development and as result, they actively participated in programs for lifelong learning. It is easy to observe that in the regions where the tertiary education cycle graduation rate is high, the number of those who actively participate in lifelong learning programs has reached and even exceed the EU target, such as the Nordic Members States, for example, Sweden was 52% of the population have graduated a tertiary education cycle and were the participation in lifelong programs is 29.2%.

One of the main factors is represented by the regions where predominant activity is in the field of agriculture, forestry, and fishing, where the rate of those who participated in lifelong learning programs is low. This factor can be seen in the Iberian Peninsula (Spain and Portugal) where most regions of these countries have their main activity based on agriculture, also this phenomenon can be found in the South regions (south of Italy and Greece), but especially in the EU Member States on the eastern border, where the participation rate in the lifelong learning programs is very low, for example, Romania, Bulgaria, Turkey, etc.

Another factor that contributes to the low rate of the population involved in the lifelong learning process is the average age of the active workforce. This thing constituted an important factor in the lower average of people implicated in lifelong learning in Germany where the average age of the workforce is between 60-62 years, but this factor constitutes a big problem in the Eastern Member States where the average age of the workforce in over 62 years old.

An important factor affecting the very low values of active people participating in lifelong learning programs constitutes the dramatically declining demographic factor in the EU Member States on the border of the continent, such as Greece, Hungary, Malta, Poland, Portugal, Romania, Croatia, Bulgaria, and Estonia, which in general have the lowest participation rates in education and training

An explication why in the Est of the EU the rate of participation in lifelong learning is very low, bellow 5% is because in this zone, in general, are the Member States that in the past was into the action of the communist ideology. This regime is very known that have a rigid policy of the workforce movement between companies (in general the first employer will also be the last one). Another factor of this lower percent is the active population age over 62 years old, which in this time represents the majority of the workforce, they are born and educated before the communist regime fall off, when the education was based on the communist ideology. Another explication is the predominant activity, and this is in the field of agriculture, forestry, and fishing that is made not all the times at the higher level and were the workforce do not have a high education.

Future research will be dedicated to vocational education and the new pedagogical methods and tools (together with their effectiveness and efficiency) in the context of different university-industry collaborations due to the mutual advantages for education and research activities (universities should be more

agile in providing adequate solutions for employees' trainings) [10]. In addition, there is an important potential to connect actual research results with the real needs for employees' competencies development, in the case of different companies. Thus, we appreciate that competencies management should be linked with intellectual capital management, offering a more competitiveness and strategic orientation of human resources management and to performance management, too [11-16].

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Viitorul locurilor de muncă și implementarea învățării pe tot parcursul vieții

Dezvoltarea și îmbunătățirea abilităților și capacităților umane prin educație, învățare și practică profesională semnificativă sunt factori cheie ai succesului economic, bunăstării individuale și coeziunii sociale. În ultimii doi ani s-a înregistrat o accelerare clară a adoptării noilor tehnologii în cadrul companiilor din toate sectoarele economice ceeea ce a dinamizat activitatea de formare a personalului, de învățare pe tot parcursul vieții. Motivația elaborării acestui studiu a constat în dorința de înțelegere mai bună a modului în care forța de muncă va răspunde noilor provocări și oportunități pe care cea de-a Patra Revoluție Industrială le impune pentru a forma piața și modul în care populația ocupată se adaptează pentru a învăța noi competențe.

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