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DIALOG PENTRU DEZVOLTARE

WorkTransition[CEE]

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RENEWED SOCIAL DIALOGUE FOR THE NEW WORLD OF WORK, JOB TRANSITIONS & DIGITALISATION IN TWO INDUSTRIAL SECTORS IN CEE COUNTRIES - ROMANIA, HUNGARY, SLOVAKIA - WORKTRANSITIONCEE VS/2021/0094

Study Report on the impact of technology on two sectors in Romania: Automotive and Oil & Gas

CONCORDIA EMPLOYERS' CONFEDERATION

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1. Executive Summary

1.1. Need and objectives of the study

Labour markets are now in the middle of a digital revolution. The transition towards a digitalised society has begun several decades ago, but the pace of technological changes has been unremittingly accelerating over the last years. The COVID-19 pandemic , too, acted as a catalyst for digital transformation. Organisations had to react quickly to enable remote working, transform products and services and shift to digital channels in order to meet the changing demands of customers. The transition to a low carbon economy shall also result in substantial changes in the way companies operate and, therefore, in labour markets. To compete in the "new reality", organisations have to further accelerate the implementation of new technologies.

Against the background of such transformations it is estimated that a series of changes in currently necessary skills, jobs and professions shall occur. Technological progress is expected to result globally in the transformation or disappearance of millions of jobs as well as in the creation of new jobs. There will be occupations where technology shall take over many tasks or some could be eliminated, but in the same time technology creates new, more productive opportunities or jobs. Adaptability, development of new skills, requalification shall become essential for an efficient transitions towards a future in which labour is redesigned and people work alongside machines.

Such signals urge authorities and companies worldwide to develop solutions - sound strategies, policies and programmes in order to ensure a successful transition of workers towards the jobs of the future. The first step is to understand the impact of such trends upon the workforce.

In this context, the **Concordia Employers' Confederation** initiated a research performed with the assistance of **KPMG** and **Ipsos**, as part of the **"Renewed social dialogue for the new world of work. Job transitions & digitalisation in two industrial sectors in CEE countries –Romania, Hungary, Slovakia. WorkTransitionCEE"** Project, which is co-funded by the European Union, regarding the impact of technology on two sectors in Romania: the Automotive and the Oil and Gas sectors. These two sectors are among the most powerful economic sectors of Romania in relation to the number of employees and contribution to GDP, also being prone to digitalisation.

The digitalisation of production processes and customer relationships is a key factor leading to changes in the automotive sector, which is one of the first sectors having adopted advanced technology, either by implementing sensors, algorithms and robots to enhance the car production efficiency or by introducing innovative technologies that reform the business models in the automotive industry. As regards the Oil and Gas industry, the new technologies represent an important solution for the management of the natural decline in hydrocarbon production while also increasing cost efficiency, for the benefit of final consumers as well.

This research aims at mapping the trends, challenges and opportunities correlated with the transition of jobs as an effect of digitalisation and automation in the two industrial sectors in Romania, as well as at identifying the expected amplitude of such transformation in the area of skills and professions of the employees in the participating companies.

1.2. General context

Globally the labour market is experiencing deep changes under the impact of some mega trends:

Digitalisation and transition to the green economy shall transform, to a larger or smaller extent, all jobs, some professions could see a decline or even disappear while new ones take their place. But the future of labour is not only about technology, it is shaped by a series of mega-trends

- **The pandemic** sped up the digitalisation and technology-driven steps of companies as well as the adoption of new working means.
- **Consumers** look for a greater digital interaction and show a more careful consumption behaviour - from the impact upon the environment to the responsible trading or the safety of cyberspace.
- **The commitments taken** to reduce greenhouse gas emissions put substantial pressure on the labour market. Special emphasis is placed on the carbon reduction in energy and transportation sectors, and the occupational employment share in fossil fuel industries is expected to decrease over the medium to long term.
- **Demographic changes** put additional pressure - the global talent pool becomes smaller and more expensive as the population grows older.
- **The geopolitical environment** is continuously changing, with significant implications for the world's societies and economies. Ukraine's invasion by Russia, besides launching a humanitarian crisis in Eastern Europe, is generating economic effects which shall be felt worldwide and slow down the general growth, thus adding to the already developing inflationary pressures.

Such developments have different dynamics in each economic sector, depending upon their specific character, and the two sectors under analysis are influenced by several specific trends:

In the Automotive Industry:

the **key trends** are the transition to electric vehicles and the emphasis on connectivity and digitalisation in development, besides others such as: industry 4.0 and the manufacture of the future, near-shoring, increased demand of cars from the East, emphasis on means to optimise resources, qualified labour force shortage and changes in business models from product-centric approach to customer and services-centric approaches.

The Oil and Gas Sector

seems to permanently contend with **uncertainty** and with a potential **volatility**, influenced by factors such as: variations in consumers' demand, price fluctuations, impact of COVID-19, decarbonisation efforts in regard to the growing pressure generated by climate changes and, of course, geopolitical issues which enhance the need to ensure energy system safety. Such challenges - alongside the descending trend as regards traditional production capacities, the aging of population and the high share of older workers - puts additional pressure on the organisations in this sector.

Worldwide studies anticipate that many jobs will be transformed or even replaced by technology as technology develops.

At the same time **technology entails the creation of new occupations and offers workers many opportunities to develop skills and to take over tasks with higher added value and creativity**, as repetitive or dangerous jobs are taken over by technology.

Over the coming years some skills will become significantly more important while others will become less and less necessary as technology develops. The World Economic Forum refers to a "Reskilling Revolution" in regard to the Future of Jobs Survey 2020 which estimated that by 2025 about 50% of all employees would need reskilling while for 40% of the employees the share of core skills would change.

As technology rapidly becomes more intelligent, major transformations in jobs are envisaged. The World Economic Forum estimates that 85 millions jobs may be displaced by a shift in the division of labour between humans and machines, while 97 millions new roles may emerge that are more adapted to the new context of the labour market. On an average, **19.1%** of the workers in the Automotive Industry and **14.2%** in the oil and gas sector will be exposed to the risk of losing their jobs[1].

The labour market in Romania experienced significant transformations against the background of macroeconomic trends as well as of specific challenges

After two decades of economic performances which increased Romania's GDP per capita to over 60% as compared to the OECD average[2], from only approx. 30% in the early 2000s, the growth rate declined because of certain challenges such as the COVID-19 crisis, the geopolitical developments in the region, the increase in energy prices or the higher inflation.

The workforce deficit is deepened by the unfavourable demographic trends and the emigration phenomenon. The lack of workforce and of competencies is a major challenge which has been facing the labour market in Romania for several years already and which may threaten the country's long-term growing perspectives.

Salaries are increasing but the rate is declining, and the labour productivity is still relatively low as compared to other countries. Salaries in Romania have rapidly increased over the last years, but the COVID-19 crisis affected the salary growing rate. Although important progress has been made in the area of labour productivity as well, it still remains relatively low as compared to other countries, at approx. 2/3 of the OECD average[3].

There is a disparity between the demand and the offer of skills due to the low performances of the educational system. According to the European Skills Index - ESI (the European indicator measuring the performance of EU skills systems Romania is part of the countries with the lowest results, in particular with regard to the development and activation of skills (Cedefop, 2019[4].

The COVID-19 deepens the labour flexibilization trend in Romania as well. After COVID-19 forced us to find new ways to work efficiently, the market signals show movements towards labour flexibilization both as regards a hybrid working model and flexible working hours, and as regards the type of contract between employees and companies, while the new Generation Z shall lay stress on the project-based work.

Despite some progress, Romania is still lagging behind in digitalisation, ranking 27th out of the 27 EU member countries according to the Digital Economy and Society

[1]World Economic Forum, The Future of Jobs Report 2020, 2020
[2]OECD, Romania 2022 OECD Economic Survey Executive Summary

[3]OCDE, Romania 2022 OECD Economic Survey Executive Summary
[4]https://ec.europa.eu/info/sites/default/files/2020-european_semester_country-report-romania_ro.pdf

Index (DESI)[5] as regards its progress in digital competitiveness in areas such as the integration of digital technologies by companies and the digital public services, the human capital and the wide-band connectivity.

1.3. Summary of the study results

Digitalisation and automation gain momentum in the Automotive and Oil and Gas sectors

As regards the rate of adopting new technologies - although the participating companies are divided mainly in connection with a medium timespan of transformation - some of the interviewed leaders anticipate its acceleration while others expect a constant rate, the conclusion is clear - digitalisation and automation shall continue to enhance within companies.

The Automotive Industry is the strongest economic sector in Romania, generating **14%** of the GDP an over **26%** of national exports. Furthermore, the automotive sector is one of the first sectors having adopted advanced technology, either by implementing sensors, algorithms and robots in order to increase the car production efficiency, or by introducing technological innovations in the automotive industry business models. The study confirms the participating companies' intention to continue the implementation of technology with the aim of maintaining their competitive advantage in the context of the digital revolution underwent by this industry at European level.

The top executives of the Romanian automotive sector companies consider that, for this sector, **the transition to electric vehicles with batteries is the most significant trend for the future.**

The top executives in the Oil and Gas sector also confirm **an accelerated adoption of technology** due to the need to enhance the efficiency of production so as to counteract the effects of mature deposits exploitation, although opinions differ with regard to the rate of adoption. In Romania the industry began to adopt technology still in the '80s, but digitalisation programmes have lately developed due to the accelerated development of technologies offering new efficiency-increase opportunities. Moreover, in the context of Romania's commitments to decarbonise the energy sector, the investments in highly performing technologies in the production processes and the replacement of old equipment become crucial.

Among the significant trends which shall affect this sector, reference was made to: the pressure caused by climate changes, the reduction of consumption and the diversification of energy-obtaining sources, the emphasis on investments in technology in order to increase the efficiency and to optimise the traditional activity. The risks generated by the military conflict at our borders stress the need to diversify the energy mix and to invest in new exploitations to ensure the energy security even if Romania's dependence upon Russia is one of the lowest in Europe.

From the perspective of the occupants of the jobs analysed in the two sectors, **the technology is already here**, and **the changes are already visible and present.** Asked how quickly they consider such changes are taking place technologically in the industry they work in, **more than half of the employees see the changing rate in their industries as moderate**. Most employees in both industries are aware of the technological progress benefits in their work.

The current trends also bring significant challenges both for employers and for employees

Besides the benefits generated by the adoption of technology, from the reduction of costs, higher efficiency of processes, access to data and shorter decision-making time to the increase in productivity or the diversification of production, the companies have to cope with a series of challenges as well.

The workforce's resistance to change and their effort to adapt to the new reality, the lack of the skills required to handle the new technologies and the management of several workforce generations, who have different levels of appetite, expectations and training, are some of the most significant challenges mentioned by the top executives of the companies participating in this study.

Although they are mostly aware of the changes in the world in general and in their industry in particular, **the occupants of the analysed jobs are concerned about the impact such changes have upon them as individuals and as employees.**

[5]Digital Economy and Society Index (DESI) 2021, European Commission

Estimations show a dynamics of skills in the context of digital transformations

The study confirms the global trends regarding the emerging skills. Thus, the direct supervisors of jobs consider that the **digital skills**, i.e. the skills needed to use various software programmes and applications, to analyse and extract relevant information from large volumes of data (big data) and to generate predictions, as well as the **training** skills are among the most important future skills in both sectors.

Table 1: Top of the skills with the greatest growth in importance in the future as against the present, in the context of technological evolution

Category of skills	*Automotive Sector*	*Oil and Gas Sector*
Basic		Monitoring the performance
Cognitive	Solving complex problems	Inductive reasoning
Digital and Technology	**Using software** System analysis Operation and control Installation	**Using software** System evaluation Scientific approach
Social	**Training** Customer orientation	**Training**
Management		Material resource management

Source: Perspective of the direct supervisors of analysed jobs

The direct supervisors of analysed jobs estimate that the skills due to decrease in importance are manual dexterity, data collection, organisation, processing and reporting skills, which are in particular at the core of repetitive activities.

The occupants of analysed jobs consider that **the skills due to register significant decreases in both sectors are Operation Monitoring and Performance Monitoring, whereas their supervisors estimate that the two skills shall grow in importance.**

Automation and digitalisation shall generate transformations in occupations as well

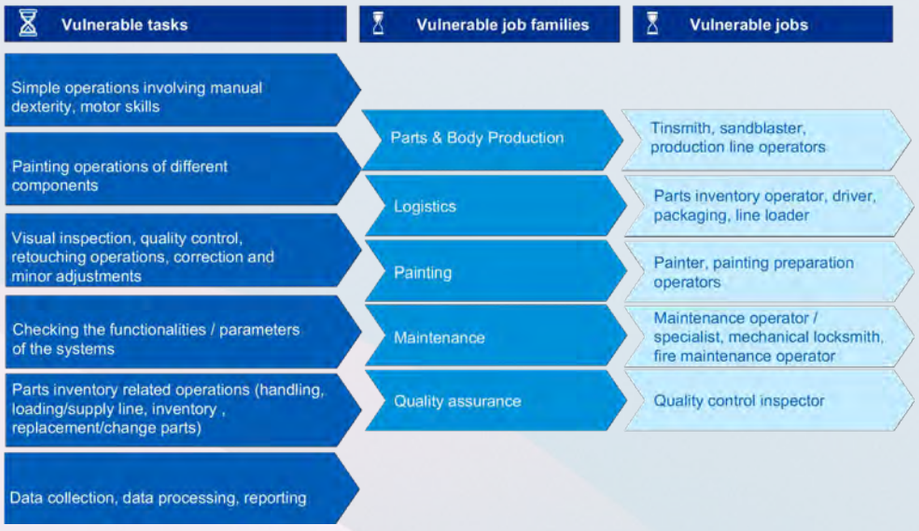
Organisations expect changes in the workforce structure but, although a descending trend is anticipated owing to cost optimisation opportunities due to technology, no significant job reductions are envisaged on short- and medium-term.

Conversely, the qualitative changes shall be significant as organisations shall need new sets of skills and the average level of skills shall continue to grow.

The occupations identified as having a higher exposure to technology are those with a high degree of predictability and repetitiveness in performing their duties, which require the handling of a clearly defined set of information and which involve duties that can be relatively easily taken over by technology. The analysis of duties and of their propensity for technology, resulted after the direct supervisors of jobs assessed the exposure to technological evolution criteria, shows a series of jobs, or of job families, that are more exposed to technology.

In the Automotive Sector:

Diagram 1: Impact of high-exposure duties on jobs and job families in the Automotive sector

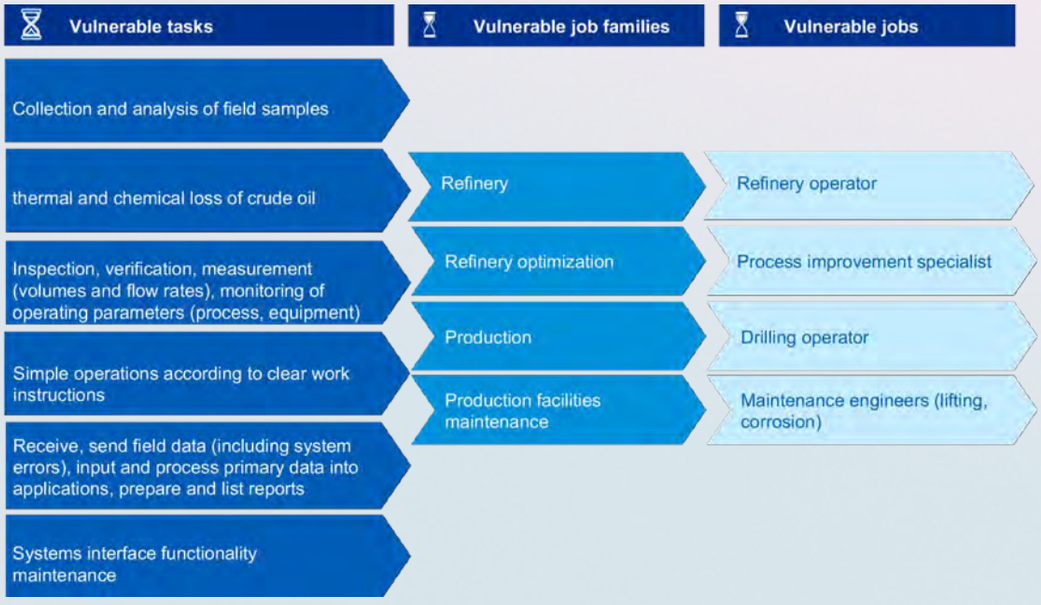


Source: analyses made based on the opinions expressed by the direct supervisors of jobs, the Automotive Sector

In line with the supervisors' estimations, the analysis of the answers given by the job occupants showed that the main jobs in the automotive industry exposed to technological advances share skills such as Operation and control, Visual acuity or Order control. According to employees' opinion, the job families covering low-importance skills for the future are mainly **Logistics, Maintenance and Quality Assurance.**

In the Oil and Gas Sector

Diagram 2: Impact of high-exposure duties on jobs and job families in the Oil and Gas sector



Source: analyses made based on the opinions expressed by the direct supervisors of jobs, the Oil & Gas Sector

The quantitative analysis of the job occupants' answers revealed that the job families targeted by technological advances in the Oil and Gas industry are mainly **Support and Administrative Operations, Control and Dispatch and**, respectively, **Refining** (given the number of exposed skills, the exposure degree or both, a perspective partially different from the one expressed by the supervisors of analysed jobs.

Except for the specialised training, no consensus appears in the opinions voiced by the job occupants as regards the working conditions in the future in the two industries under analysis.

Most occupants of the analysed jobs in the **Automotive** sector have similar opinions about the positive changes incurred by technology such as less manual labour and increase in the employees' training level. As regards the **Oil and Gas sector**, most employees anticipate less manual labour and increase in the workers' training level but also less positive changes such as stricter supervision / control at the working place, increased workload and greater work-related stress.

Employees are familiar both with general technological knowledge and with those linked to their professional area

The employees were also asked about their familiarity with certain current notions which can prove both their attention and openness for technology, and their openness for learning new notions, as a first step towards actually working with such notions and putting their new knowledge into practice. So, electrical vehicles, green energy and cryptocurrency are the most familiar notions of the interviewed employees, no matter the industry they are working in, while the least familiar is IoT (Internet of Things).

With just a few exceptions, the employees in the Oil and Gas industry are better informed about the new technology and digitalisation concepts in the public space nowadays.

The interviewed organisations realise the impact of technology on the workforce and they began to identify and implement measures aimed at facilitating the transition

Companies understand and accept the increasing need to prepare the workforce for the new reality. Moreover, they stress the need for **transparency in addressing their employees with regard to the companies' strategic priorities**, for clearly communicating their key objectives and expected behaviour on behalf of their employees, as well as the need for this subject to increase in popularity.

According to interviewed executives, **the planning of the workforce so as to develop the future skills of the organisation** is crucial, and it has to take into consideration strategic priorities, current capabilities as well as the capabilities required to implement the strategy.

The defining and implementation of a coherent skill development programme represent measures already initiated by companies, as the interviewed executive stated. The main actions to this end are: the continuous and specific training, the reskilling, the particular development of digital and software skills.

The continued partnership for dual education is also identified as a very important measure in the context of automation and rapid digitalisation, because it ensures new pools of young employee generations who are already prepared when joining the companies and can adapt easier to technology. The executives in the Automotive and Oil and Gas sectors emphasize the need for sectoral strategies, for aligning educational system with business requirements and for the cooperation of all social partners in order to ensure the transition to future jobs.

The representatives of analysed companies confirm that **reskilling and professional reconversion can be useful if some jobs can be affected by technological advance in the future**. The study identified several migration opportunities in the two sectors, both within and outside the company.

The analysed employees wait primarily the employers' support, but they are also ready to learn by themselves. Asked what they are going to do personally when confronted by the technological development, the employees in the two sectors said they would rather appeal to the employers' support - for training programmes or for protection against technology risks - or start self-training than asking for the state or trade union assistance. The change of the workplace or the lack of a concrete reaction are among the least important actions in this context.

1.4. Conclusions and recommendations

Here are the conclusions after processing the information collected during this study:

- The adoption of technology within analysed industries is increasing.
- Companies are conscious of the digital transformation but the projects on the future workforce are still limited.
- Organisations estimate that technology shall influence the workforce structure mainly qualitatively.
- Besides digital skills, there is a growth in significance of transversal and soft skills.
- Some skills associated with manual, repetitive tasks become less and less important.
- As companies adopt more technology, occupations shall undergo a transition and a new workforce class shall appear.
- The assurance of a prepared workforce is still a challenge for companies.
- Employees are familiar with global trends and with the importance of technology for their sectors, but they are not aware of its impact on occupations.
- The employees in the two sectors are open to technology provided that they receive assistance and training on behalf of their employers.

In view of the aspects identified by the study, we propose several recommendations.

- Transformation of the strategic workforce planning in companies towards agile processes, based on foresight and scenario planning.
- Identification of critical skills and development of skills for the future.
- Consolidation of transversal skills.
- Endowment with digital skills.
- Development of continuous training systems in order to support the approach of continuous training during one's lifetime.
- Correlation of the skills obtained during school years with the realities of the Romanian economy.
- Development of organisational cultures open to change.
- Growth of the employees' level of acquaintance with the expected changes.
- Cooperation between the public and private systems in order to prepare the employees for the digital economy.

2. General context

Trends shaping the labour market worldwide

Globally, the labour market undergoes a period of deep changes under the impact of mega trends.

As technology develops, some jobs decline and could even disappear, while other, new ones take their place. To a larger or a smaller extent, all jobs shall transform due to digitalisation and the transition to the green economy.
However, the future of labour refers not only to technology but it is shaped by some mega trends as well.

The pandemic sped up not only the digitalisation and technologisation agenda but also the adoption of new working ways, the pandemic experience causing the change of employees' expectations about flexible working models, greater connectivity and communication. Distance work shall become usual as it is highly unlikely to return completely to the office work. Hybrid working models shall prevail, which means that organisations shall have to consolidate their technological infrastructure.

Consumers anticipate a greater digital interaction and are more attentive to the aspects connected with their consumption behaviour: the impact on environment, carbon footprint, food safety, responsible trading as well as data and online security.

The change in labour is partially caused by demographic changes as well. While technology becomes more sophisticated and more accessible, the global talent pool becomes smaller and more expensive as population grow older. At the same time, the increase in life expectancy can lead to the gradual rise of pension age and the extension of active life against the background of general concerns regarding the sustainability of public pension systems and the states' capability to ensure adequate incomes to pensioners.

Global estimations show that over 2010-2050 the urban population shall double[6], and urbanisation is a continuous phenomenon in Europe as well, as regards both the expansion of urban land and the increase in urban population, which has an influence both on the socio-economic development of some regions and on the population's occupancy rate.

Against the background of climate changes, the commitments taken to reduce greenhouse gas emissions at European and world level, by decarbonisation policies and regulations, put significant pressure on the labour market. The European Green Deal sets the actions aimed at changing Europe into the first continent with no net emissions of carbon dioxide by 2050. Great emphasis is placed on the energy sector decarbonisation by gradually eliminating coal, the

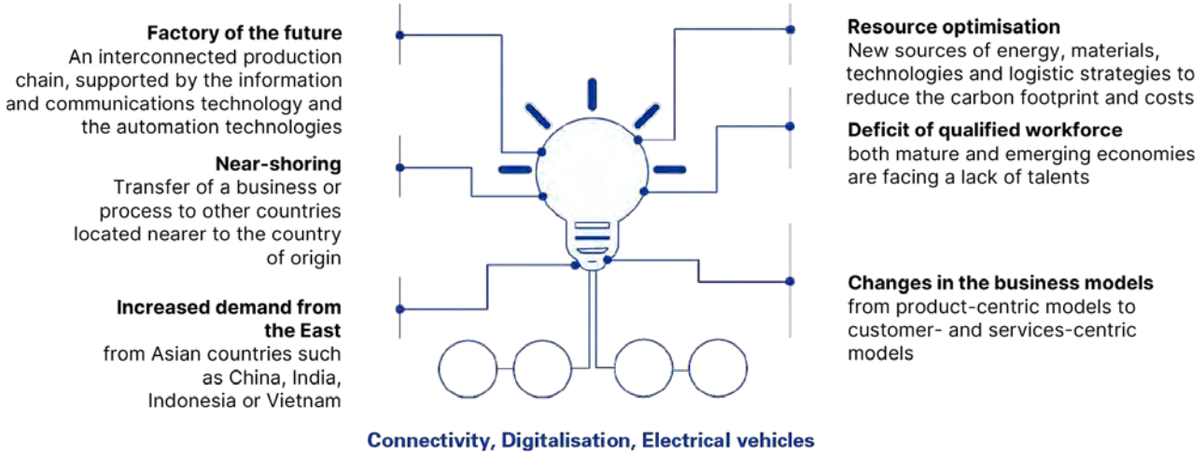
[6]World Economic Forum, The Future of Jobs, 2016

decarbonisation of the gas sector and the increase in renewable energy sources, while the occupancy in the fossil fuel industries is expected to decrease in the medium and long term.

The geopolitical environment is changing continuously, with significant implications on the world's societies and economies, including on the supply chains, trade and workforce availability. Among the most affected sectors, oil and gas, agriculture or aviation and tourism need to adapt as quickly as possible, while the energy security measures become crucial.

Specific trends are noted at the level of the two analysed sectors

Trends in the Automotive sector[7]

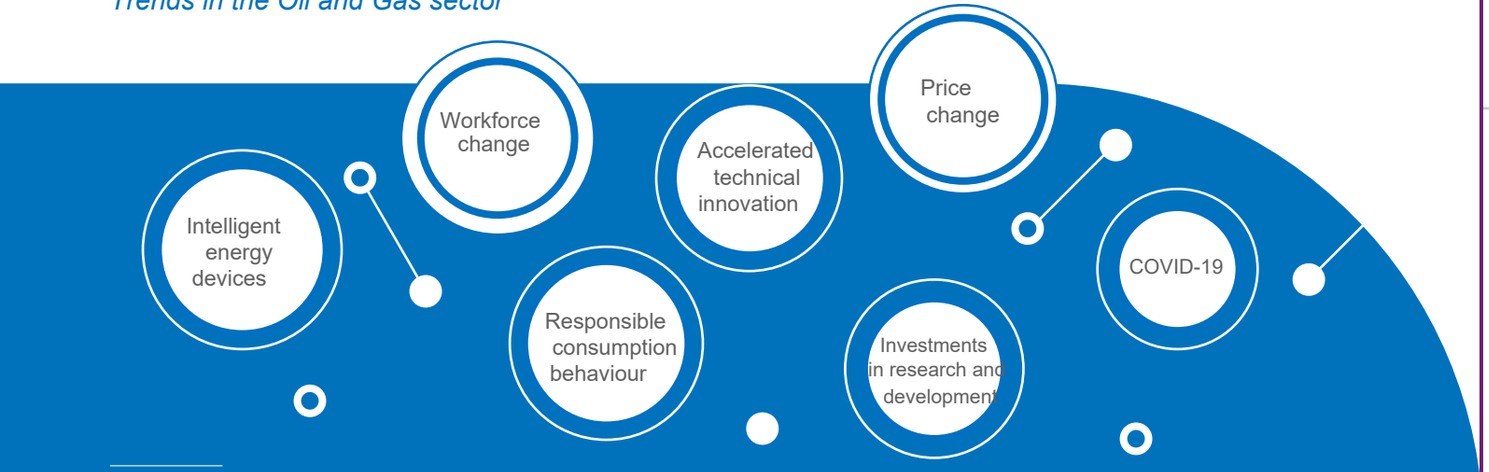


A global study carried out by KPMG Automotive Institute[8] reveals that the three general key trends by 2030 are:

1. Connectivity and Digitalisation
2. Electric vehicles with batteries
3. Electric vehicles with fuel cells I

In this context, the interviewed executive managers consider that a change in the automotive industry is imminent and the players shall have to continue their development by defining a new role for themselves besides the traditional expertise.

Trends in the Oil and Gas sector



[7]KPMG Germany, Megatrends Research

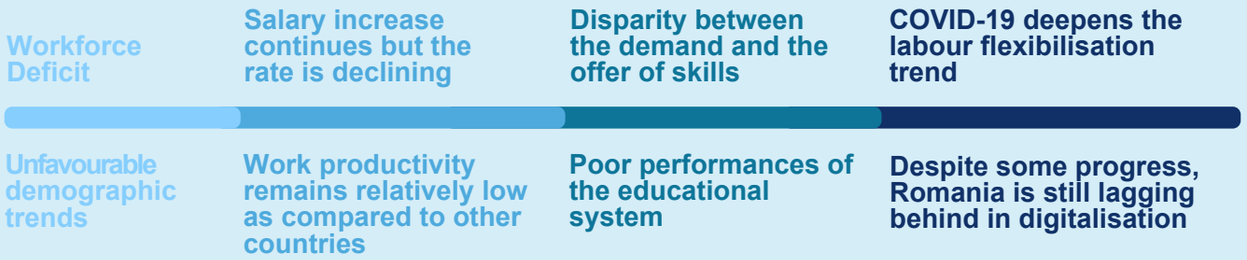
[8]KPMG Automotive Institute, Global study of the executives in the Automotive industry, 2020

The Oil and Gas sector seems to be permanently confronted with uncertainty and a potential volatility generated by the increase and decrease of consumers' demand, price fluctuations, COVID-19 impact, decarbonisation efforts, increasing pressure caused by climate changes and, of course, geopolitical issues. Such challenges, combined with the distinct skills and characteristics of the Oil and Gas activities, affect the workforce in ways unique for this sector. The deficit of skills is an older problem which underscored the need of the Oil and Gas industry companies to develop their existing workforce and to enrol new employees as the qualified employees in the sector approach the pension age.

The current trends bring significant challenges both for employees and for employers. Each group has to accept the implications of the changes and the new concept of labour in the coming years.

Labour market in Romania

The labour market experienced significant transformations against the background of macroeconomic trends and of specific challenges



After two decades of economic performances which increased Romania's GDP per capita to over 60% as compared to the OECD average[9], from only approx. 30% in the early 2000s, the growth rate declined because of challenges such as the COVID-19 crisis, the geopolitical developments in the region, the increase in energy prices or the higher inflation.

According to the data published by the National Institute of Statistics, the gross domestic product grew in 2021 by 5.9% as compared to 2020[10], an increase caused mainly by the internal consumption. Towards the end of the year the growth rate declined because of the limitations imposed by the supply chains, of a new wave of COVID-19 infection and of a higher inflation. However, despite these factors, deepened by the new geopolitical context as well, prognoses show an increasing although moderate trend, in particular in services, retail trade, constructions and industry[11].

The workforce deficit is deepened by the unfavourable demographic trends and the emigration phenomenon

The lack of workforce and of competencies is a major challenge facing the labour market in Romania and which may threaten the country's long-term growing perspectives.

After decades of demographic decline caused by the birth rate descent and a negative growth, the population aging and the migration increase, the lack of qualified personnel is a major challenge, in particular for some sectors of the Romanian economy such as the services, constructions and industry sectors.

The demographic forecasts for the next 40 years show a significant decrease of the active population, with a negative impact on the labour market. According to the European Commission's predictions, if a significant impact of net migration is felt by 2050, the total population will decrease from 19.6 mil. people in 2016 to 18 mil. people in 2030 and to approx. 15 mil. people in 2070, while the working-age population will decrease from 13.2 mil. people in 2016 to 11.4 mil. people in 2030 and to 8.3 mil. people in 2070[12].

[9]OECD, Romania 2022 OECD Economic Survey Executive Summary

[10]https://insse.ro/cms/sites/default/files/com_presa/com_pdf/pib_tr4r2021_2.pdf

[11]https://ec.europa.eu/info/business-economy-euro/economic-performance-and-forecasts/economic-forecasts/winter-2022-economic-forecast-growth-expected-regain-traction-after-winter-slowdown_ro

[12]Concordia Employers' Confederation, "Quantitative and qualitative analysis of the labour market in Romania" Report, 2019

Although over the last years Romania has registered a positive dynamics of the labour market indicators, with an increasing workforce occupancy, the inactivity rate is still high, above the EU average and there are significant differences between regions and age groups. As per the National Institute of Statistics (NIS)[13], in 2021:

- The occupancy of the population aged 15-74 was 76.9%, an increase by 1.6 percentage points compared to the previous year and by 8 percentage points compared to 2013.
- The occupancy of youngsters (aged 15-24) is low - 21.2%, while that of old people (aged 55-64) is 43.8%.
- The unemployment rate was 5.6%, a decrease as compared to the previous year (6.1% in 2020). The highest (21.0%) is the unemployment rate of youngsters (aged 15-24).
- The structure of the workforce occupancy by sectors shows an important share of the population involved in activities with lower qualifications and skills such as agriculture (21.8%) or industry (20.8%), a trend contrary to modern economies in which agriculture is restricting its occupancy share in relation to the other branches. As regards the skills, such a structure can denote a higher vulnerability of the employees, but in view of the transition towards a digital and green economy it is highly important to develop a better qualified workforce which is more capable to transfer within and between economic sectors.

Salaries are increasing but the rate is declining, and the labour productivity is still relatively low as compared to other countries

Salaries in Romania have rapidly grown over the last years but the COVID-19 crisis affected the growth rate. Thus, in December 2021, the net average nominal salary amounted to 3879 RON, an increase by 6.4% as compared to the previous month and by 7.2% as against December 2020[14]. However, the level of inflation damages the salary increases. In the first month of this year, the yearly increase of the net average salary in the economy was by only 0.5 percentage points higher than the January inflation, according to the NIS data.

Labour productivity remains, however, relatively low as compared to other countries, at about 2/3 of the OECD average[15], although significant progress has been made in this area as well. According to EBRD, the labour productivity per employee registered the highest increase in Romania over 2005-2017 as compared to its regional colleagues, from less than 40% of EU28 average, the lowest starting point in 2005, to 65% in 2017, but this level is still relatively low as compared to EU levels[16].

The still low cost of the workforce remains a decisive factor in attracting foreign investments but we get closer to the inflexion point where it no longer represents a competitive advantage. Its growth due to the quicker increase of salaries than of labour productivity may have a negative iimpact on Romania's competitiveness, which could be a further argument in favour of digitalisation and technologisation of the companies in the market.

The 2020 Study of the Friedrich-Ebert Foundation[17] concludes that the productivity in Romania cannot (any longer) grow significantly under the conditions of under-capitalisation, technological under-development and peripheral economic specialisation – the change of the economic development model is a necessity. Romania is still a country with an economy focused mainly on less complex products and services which have a low added value. Therefore, digitalisation also comes as a structural necessity in order to keep the economy competitive in the medium term.

There is a disparity between the demand and the offer of skills due to the low performances of the educational system

Another major challenge in the labour market is the disparity between the demand and the offer of skills. According to the European Skills Index - ESI (the European indicator measuring the performance of EU skills systems) Romania is part of the countries with the lowest results, in

[13] https://insse.ro/cms/ro/tags/comunicat-ocuparea-si-somajul

[14] https://insse.ro/cms/sites/default/files/com_presa/com_pdf/cs12r21.pdf

[15] OECD, Romania 2022 OECD Economic Survey Executive Summary

[16] European Bank for Reconstruction and Development, Country Strategy of Romania 2020-2025

[17] Friedrich-Ebert Foundation (FES) Romania together with Syndex Romania, Study "The Productivity Issue – Controversies and Clarifications", 2020

particular with regard to the development and activation of skills (Cedefop, 2019)[18]. Thus, according to the European Commission[19] reports:

- Romania is one of the countries with the greatest share of students with low results among the youngsters aged 15, in all the three areas tested as part of the OECD Programme for International Student Assessment (PISA), and the results got worse since 2015.
- There still are high shares of the students leaving school early (15.3% in 2019) and of the youngsters not in education, employment or training (NEET) (14.7%)[20].
- The over-qualification rate almost doubled in recent years, although it still is below the EU average, which reveals a significant gap between education and labour. In 2018, 18% of the tertiary qualified employees were working in jobs that did not require such a qualification, while 28% of the tertiary qualified employees aged 25-34 worked in jobs that required such studies, but their education or skills did not match the job requirements (Eurostat, indicators of non-concordances).
- The participation in higher education is low and remains insufficiently aligned to the needs of the labour market. The number of the graduates of science, technology, engineering and maths (STEM) is also still low.
- The share of the youngsters aged 16-19 who assess their digital skills as low is among the highest in EU (39% as compared to the EU average of 15% in 2019).
- Figures reveal a great need for improvement, emphasised by the changes anticipated in the labour market in the context of the transition towards a digital and green economy. According to EC, 21.5% of the adults had a low training level and only 0.9% of the adults aged 25-64 had a recent learning experience in 2018, as compared to the EU average of 11.1%.
- Romania has poor results, too, with regard to the adults' participation in learning during their entire life, its percentage being 1% as compared to the EU average of 9.2%, ranking last among the European Union countries[21].

COVID-19 deepens the labour flexibilisation trend

After COVID-19 forced us to find new ways to work efficiently, the market signals show movements towards labour flexibilization both as regards the distance work in the form of a hybrid working policy and flexible working hours, and as regards the type of contract between employees and companies (freelancers and project-based workers vs. permanent employees). As the new Generation Z enters the labour market, the trend towards the independence given by project-based work is expected to get greater, to the detriment of the classic working system with long-term contract and daily working hours.

At the same time, the post-pandemic labour market is confronted with a greater mobility of the employees. After a period when the personnel fluctuation reduced because of the economic instability, the employees became much more active on the labour market and more open to professional change. Some experts call this movement *The Great Resignation*, a phenomenon rooted in the United States, which warns about subjects such as the professional life-personal life balance, the employees' welfare, stress and burnout. This phenomenon underscores the need of sound human capital management strategies in organisations in the context of the personnel deficit and of the fight for talents which were characteristic for the labour market even before the pandemic.

[18]https://ec.europa.eu/info/sites/default/files/2020-european_semester_country-report-romania_ro.pdf

[19]https://ec.europa.eu/info/sites/default/files/2020-european_semester_country-report-romania_ro.pdf

[20]https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1591720698631&uri=CELEX%3A52020DC0523

[21]Ministry of Education, Report on the pre-university education in Romania 2020 – 2021

Despite some progress, Romania is still lagging behind in digitalisation

Romania is ranking 27th out of the 27 EU member countries according to the 2021 issue of the Digital Economy and Society Index (DESI)[22], although it made some progress in recent years. The Digital Economy and Society Index (DESI) refers to the progress made by the EU member states as regards digital competitiveness in areas such as the integration of digital technologies by companies and the digital public services, the human capital and the wide-band connectivity.

Our country ranks 25th as regards the digital technology integration into the activities of companies, most of its indicators being much below the EU average.

As regards the human capital, Romania ranks 26th, most of its relevant indicators being below the average. Less than one third of the persons aged 16-74 have at least basic digital skills as against 56% at the EU level and only 10% of the persons have digital skills above the basic level. Although we are among the first-ranking countries as to the number of TIC graduates (ranking 4th), the report emphasizes that the deficit of TIC experts limits the country's capacity to innovate and to make best use of the digital transformation advantages. The number of the enterprises offering TIC training to their employees is also very low, at only 6% as compared to the EU average of 20%.

Perspective on the impact of technology on the workforce

In the coming years some skills shall increase significantly in importance, while some shall be less and less necessary, in view of the technological evolution

The World Economic Forum refers to a "Reskilling Revolution", and the Future of Jobs Survey 2020 estimated that, by 2025, 50% of all employees would need reskilling, while for 40% of the employees the share of core skills would change.

The skills supporting the implementation, maintenance, use, monitoring and control of technology, as well as those associated with the robotised automation of processes and with working with virtual / augmented reality , cyberspace security, data analysis/science shall significantly increase in importance due to the technological advance, according to global estimations automatizarea robotizată a proceselor și de lucru cu realitatea virtuală / augmentată, securitate cibernetică.

Furthermore, in order to support the new types of activities generated by technology evolution, emphasis shall be placed on some transversal skills such as critical thinking and analysis, solving of complex problems, personal development skills (active learning), adaption skills (resilience, stress tolerance and flexibility) as well as working with people și de lucru cu oamenii.

[22] European Commission, Digital Economy and Society Index (DESI) 2021

Graph 1: Emerging skills in the context of technology evolution

Sources:

World Economic Forum, The Future of Jobs Report 2021, 2021

European Commission (DG Grow), The Report of the High Level Group on the Competitiveness and Sustainable Growth of the Automotive Industry in the European Union (GEAR 2030) – Final report, 2017

"The automotive industry on the brink of a new paradigm? (Information report)", European Economic and Social Committee, Consultative Commission on Industrial Change, 2017, https://www.eesc.europa.eu/ro/our-work/opinions-information-reports/information-reports/automotive-industry-brink-new-paradigm-information-report

Top 10 Oil & Gas Industry Trends & Innovations in 2021, https://www.startus-insights.com/innovators-guide/top-10-oil-gas-industry-trends-innovations-in-2021/

7 Oil & Gas jobs that will exist in the future , https://www.ge.com/news/reports/dan-jackson-7-oil-gas-jobs-that-will-exist-in-the-future

Whereas the categories of skills expected by the World Economic Forum[23] to decrease in significance worldwide include the identification, collection, operation and processing of data as well as those involved in physical, manual activities (physical shape, visual acuity, motricity, colour discrimination).

As technology takes over certain tasks and a series of skills become less important, major transformations of jobs are expected.

Although it is quite clear that digital transformation and automation offer great opportunities, some global studies show that many roles shall be replaced by technology and many jobs shall disappear:

- The World Economic Forum estimates that, because of the shift in the division of labour between humans and machines, **85 million jobs could be displaced**, but other **97 million new roles may emerge**, adapted to the new context of the labour market;
- By 2030, approx. **20 million jobs may be replaced by robots** in the processing and production industries worldwide, as per Oxford Economics[24];

[23] World Economic Forum, The Future of Jobs Report 2021, 2021

[24] Oxford Economics, ''How robots change the world''

- According to the World Economic Forum, on an average **19.1%** of the Automotive industry employees and **14.2%** of the oil and gas sector employees are exposed to the risk of job displacement[25];
- The change in the production processes may lead to the **creation of over 2 million jobs** in the European automotive sector. However, the transformation of skills and of workforce shall result in the disappearance of approx. 120,000 jobs, in particular in the production sector[26];
- The initial results of a Fraunhofer IAO study reveal that, în cel mai bun caz, approx. **10-12%** of the jobs involving propulsion systems shall disappear by 2030, due to the technological transition in the European Automotive industry. Risks in the workforce occupancy also derive from the digitalisation and relocation of production to other regions of the world[27];
- Rystad Energy considers that at least **20%** of the jobs in certain Oil and Gas segments such as drilling, operational support and maintenance could be automated in the next 10 years[28].

Other studies on the impact of automation on jobs have a more conservatory vision and underscore the **probability that certain jobs would be rather changed than displaced**. Such studies start from the assumption that, although a task can be automated, this does not necessarily mean that it shall be automated, but it depends upon the economic context, the political environment and various practical aspects and constraints involved[29].

Estimations show a dynamics of skills also in the Automotive and Oil and Gas sectors

In the Automotive industry researches show that some jobs shall be more exposed to displacement or to significant transformation due to technology evolution, while other new jobs shall be created or shall become more important.

Table 2: Examples of exposed and declining jobs in the Automotive industry

Examples of exposed and declining jobs		
Assembly worker and factory worker	Technician and car mechanic**	Adjuster and electric and electronic repair worker, Transports**
Car glass adjuster and repair worker*	Body maker and repair workers **	

**Source: Frey C.B., Osborne M. (2013), The future of employment: how susceptible are jobs to computerization?*
***Source: International Labour Office, Sectoral Policies Department, The future of work in the automotive industry: The need to invest in people's capabilities and decent and sustainable work – Issues paper for the Technical Meeting on the Future of Work in the Automotive Industry (Geneva, 15–19 February 2021), 2020*

[25]World Economic Forum, The Future of Jobs Report 2020, 2020
[26]International Labour Office, Sectoral Policies Department, The future of work in the automotive industry: The need to invest in people's capabilities and decent and sustainable work, Issues paper for the Technical Meeting on the Future of Work in the Automotive Industry (Geneva, 15–19 February 2021), Geneva, 2020
[27]European Economic and Social Committee, ''Make sure vehicle decarbonisation is a win for labour as well as climate, says EESC to EU legislators''
[28]Rystad Energy, '' Robots could replace hundreds of thousands of oil and gas jobs, save billions in drilling costs by 2030''
[29]International Labour Office, Sectoral Policies Department, The future of work in the automotive industry: The need to invest in people's capabilities and decent and sustainable work, Issues paper for the Technical Meeting on the Future of Work in the Automotive Industry (Geneva, 15–19 February 2021), Geneva, 2020

Table 3: Examples of emerging jobs in the Automotive industry

Examples of emerging jobs		
Data Analysts andData Scientists*	Environmental protection engineer *	Product engineer **
Business development specialist *	Management and organisation analyst *	Process engineer**
Specialist in artificial intelligence and automatic learning*	Digital transformation specialist *	Engineer/ Technician R&D **
Strategy Consultant*		
Materials engineer *	Database and network specialist *	Product designing and development technician **

** Source: World Economic Forum, "The Future of Jobs Report 2020", 2020*
*** Source: International Labour Office, Sectoral Policies Department "The future of work in the automotive industry: The need to invest in people's capabilities and decent and sustainable work - Issues paper for the Technical Meeting on the Future of Work in the Automotive Industry"*

Researches also show that, in the Oil and Gas industry, some jobs shall see major transformations or shall be displaced as technology develops, while others are created and/or become more important:

Table 4: Examples of exposed and declining jobs in the Oil and Gas industry

Examples of exposed and declining jobs		
Adjuster and installation repair worker *	Operator in crude oil and gas refining plant **	Operator in mine and oil factories **
Mining and crude oil extraction worker*	Electrical energy production installation operator **	Rotary drilling operator***

**Source: World Economic Forum, "The Future of Jobs Report 2020", 2020*
*** Source: World Economic Forum, "The Future of Jobs Report 2018", 2018*
**** Source: Frey C.B., Osborne M. (2013): "The future of employment: how susceptible are jobs to computerisation?"*

Table 5: Examples of emerging jobs in the Oil and Gas industry

Examples of emerging jobs		
Trainer Virtual reality *	Big Data specialist**	Operator TIC and user assistance technician **
Underwater drone supervisor *	Reusable energy engineernginer **	Data Analysts and Scientists**
Data Cleaner *	Process automation specialist **	Digital security specialist ***
Engineerhaptics *	Specialist in Internet of Things**	Automatic learning specialist ***
Graphic designer 3D *	Specialist in artificial intelligence and automatic learning **	Technical engineer ***
Fitter Biotech *		

** Source: "7 Oil & Gas jobs that will exist in the future", https://www.ge.com/news/reports/dan-jackson-7-oil-gas-jobs-that-will-exist-in-the-future*
***Source: World Economic Forum, "The Future of Jobs Report 2020", 2020*
****Source: The Future of Oil and Gas Jobs and Required Skills , https://codovia.com/oil-gas/oil-and-gas-jobs-required-skills*

3. Results of the study

3.1. Perspectives in the Automotive and Oil and Gas sectors in Romania

3.1.1. Perspectives with regard to the sector-defining trends

The Automotive Sector

The automotive industry is Romania's strongest economic sector, generating 14% of GDP (25.6 billion EUR in 2020) and over 26% of national exports[30]. The turnover tripled over the last decade, due to the low operational costs in Romania, which was an important competitive advantage in the European market, but we get close to the inflexion point because of the digital revolution in this industry at European level.

This industry is also one of the first sectors having adopted technology, either by implementing sensors, algorithms and robots to increase the car production efficiency, or by making technological innovations in the automotive industry business models. Digitalisation acted as a catalyst of change within the industry that over the years has experienced a series of transformations, some of them quite disruptive, in order to get a competitive advantage on the market, to become more efficient or to answer the customers' demand.

The industry faced many challenges and transformations generated both by the new market trends (emission reduction, electrification), the COVID-19 pandemic and the semiconductor crisis, and by its own digitalisation and efficiency-growing requirements. The challenge is so much greater as the industry has been confronting with a significant personnel deficit for years.

[30]ACAROM, The first meeting in Romania of the ACEA – ACAROM Connection Committee

The results of the present study reveal that **the most significant trend for the future, identified by the interviewed executives of the automotive sector companies in Romania, is the transition to electrical vehicles with batteries**, and an accelerated transition could be seen lately, as no one could have anticipated. Here are some other significant trends:

- **The development of the infrastructure** required for the charging of such vehivles and of the electrical battery production technologies, which shall develop faster as the demand for electrical vehicles with batteries increases.
- **The investments in processes and process supervision,** which grow efficiency and bring the factories in Romania closer to the *Industry 4.0* and *Smart Factories* concept, with interconnected processes, under safety and security conditions.
- **The change of the business models**, in the sense of a transition from product to service, and towards a "permanently connected" type of customer relationships.
- ***The Internet of Things*** brought about the complexity not only of the vehicles as finite product but also in the vehicle production process, facilities becoming a much more complex and interconnected environment.
- General technology also impacts the industry significantly - digitalisation, retechnologisation, new technologies. There is a trend in the Automotive market in Romania to implement **automation**, significant progress has been made lately, with hundreds of robots already active in the Romania factories, and the trend is to continue on this line.
- The COVID-19 also brought changes, such as distance work, more connectivity and communication, new working ways.
- The electronic component crisis keeps affecting the operations.

Also, **the study confirms the intention of participating companies to continue the implementation of technology in order to maintain their competitive advantage**, in the context of the digital revolution facing the industry at European level. As regards the rate of adopting new technologies, although opinions differ in the participating companies, in particular with regard to a medium timespan, as some of the interviewed executives wish an accelerated adoption and others wish a constant rate, the conclusion is clear - digitalisation and automation shall continue to expand within companies.

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*"Until a few years ago it was easier to make more manual work, it was cheaper, but this is no longer the case. In view of the implementation of automation, robotics, data, IOT etc, it is clear that Romania is no longer a **low cost country**."*

"Clearly we shall accelerate [digitalisation] as we change from internal combustion to electrical."

"For several years we have made great steps in technology, in digitalisation. We had old systems, we generated very many data, but we did not know how to use them. Much is still to be done. Maybe we are not in the first line, but the group takes great steps."

"Digitalisation shall become ever more important, we have made progress, but we still have a long way until we reach a more developed level."

"We shall accelerate digitalisation, but pressure is put on two aspects: transformation of the entire industry, which means huge costs, and the costs of support functions, which must decrease ."

"Certainly there shall be an acceleration as regards the implementation of new technologies. Now innovation is an important chapter for our company, worldwide and in Europe."

"I consider that digitalisation shall grow, but its rate shall not be as rapid, with an ascending curve as until now, but it shall be a rather significant rate. We shall continue and finalise for all the jobs, now over 60% jobs are digitalised, we shall continue this year as well."

Source: interviews with the executives of Automotive sector companies in Romania, February – March 2022

With regard to the technologies having the greatest potential of a positive impact on the development of organisations, here are some of the ones mentioned by the interviewed company executives:

- Cloud systems
- Collaborative robots
- Big data and machine learning
- Internet of Things
- Vision systems which allow inspection and control activities using optical systems and process the information obtained
- Updating of vehicle software by introducing 5G
- Technologies supporting distance monitoring and predictive maintenance

The Oil and Gas Sector

Romania is one of the main oil and natural gas producers in Europe, alongside Great Britain, Norway, Denmark, Italy and the Netherlands. With an over 150-year tradition in Romania, the industry is now confronting with some challenges among which is the natural decline of production caused by the mature state of deposits. According to the data supplied by British Petroleum[31], the oil reserves in Romania could end in the next 22.7 years as compared to the global average of 53.5 years, while the natural gas reserves could end in 9 years as compared to the global average of 48.8 years. Noteworthy is also the fact that these data do not take into consideration the reserves discovered in the Black Sea.

The crisis caused by the Covid-19 pandemic, the need of digitalisation and automation, the legislative measures, the fulfilment of climate objectives, the turbulent geopolitical context as well as the need of qualified workforce are challenges that increase the short- and medium-term pressure on the oil and gas industry. The risks generated by the military conflict at the border underscores the need to diversify the energy mix and to make investments in new exploitations in order to ensure the energy security although the country's dependency on Russia is one of the lowest in Europe.

Here are the significant trends in the Oil & Gas sector in Romania as mentioned by the executives interviewed during this research:

- A general trend to reduce consumption and to diversify energy sources. At the same time, however, Romania's economic growth resulted in the increase of energy demand, and the energy intensity remains high.
- A trend of natural production decline because of the exploitation of mature deposits, which renders attractive the new exploitations, such as the Black Sea ones.
- Emphasis on increasing the efficiency of activities by investments in technology, on optimising the traditional activity, on reorganising and prioritising projects in order to make implementation decisions, maximising the profitability chances.
- The pressure put by the free workforce movement within EU, i.e. the workforce migration and the risk of losing the highly qualified workforce.
- The salary pressure brings about the need to find new methods to increase labour productivity.
- The environmental aspects and the regulatory framework have a significant impact, which generates the need to rethink

[31] British Petroleum, Statistical Review of World Energy, 2021

- the business model. Also the industry is under the general pressure caused by climate changes.
- The customers' new expectations, which are more and more sophisticated, with greater sensitivity to environmental aspects.
- The aging of the population and the high average age of the employees in the sector are sound arguments in consolidating the skill development and upskilling programmes.
- The rapid access to applications and big data represent important opportunities for the sector, which can speed up innovation and efficiency, assisting the companies in analysing large amounts of data from different sources and generating their real-time understanding.

As part of Romania's commitments to decarbonise the energy sector so that Romania can attain the European Union targets concerning the greenhouse gas emissions, the involvement of the sector companies in renewable energy projects can promote the sustainability of the entire industry, but mass investments are needed to this end, including in highly performing technologies in production processes and the replacement of old equipment.

The interviewed executives confirm that the adoption of technology has accelerated because of the need to increase efficiency, although there are different opinions with regard to the rate of adoption.

In Romania, the industry

began to adopt technology still in the 80s, but over the last years the digitalisation programmes have intensified due to the accelerated development of the technologies which generate new opportunities. The process optimisation and the investments in technology represent key opportunities for the sector, aimed at ensuring durability, alignment with the market trends and reduction of natural decline. The exploitation of big data and the capitalisation on cloud technologies are also good opportunities to facilitate digital transformation, but the Romanian laws hinder the usage of data, contrary to the European tendency of eliminating restrictions and barriers with regard to the transfer, usage, storing, processing and access to personal data.

"We have embarked on this path [of digitalisation] for several years and we have a programme devoted to each business area."

*"We shall speed up the digitalisation agenda, there are some technologies which produced the expected goals, but the technological advance is very great, **there are technologies which** we want to implement because they proved their impact."*

"I think the investments in technology shall be sped up because of the pressure of costs, these methods lead to great cost reductions."

"I expect growing investments. We are on an increasing trend as regards technology, from the perspective of the number of projects and the budget."

"We are at the beginning of our path, only the foundation has been laid. Automation is just beginning."

"The rate shall grow, but we have to be realistic, the growth shall have a moderate rate."

Source: interviews with the executives of Oil & Gas sector companies in Romania, February – March 2022

As regards the technologies with the greatest potential to have a positive impact on the development of organisations, the interviewed company executives mentioned:

- Distance monitoring technologies
- *Big data* by cloud technologies and *data science* algorithms which allow for the rapid processing of data
- *Internet of Things* and the devices controlling industrial equipment in order to get information or to control the equipment
- Virtual/augmented reality, in particular in installations and in the areas with high health risks
- *Chat-bots* in the activities offering assistance to users, which are highly repetitive
- *RPA – Robotic Process Automation*

3.1.2. Benefits and challenges associated with the adoption of technology

Besides the benefits brought by the adoption of technology, such as cost reduction, time saving, access to data and very short decision-making time, higher productivity or growth or diversification of production, the companies have to cope with some challenges as well. And the adaption to change and the adaption of the workforce to the new needs are among the most significant challenges mentioned by the company executives who were interviewed during the research.

"The greatest internal challenge is the transformation of the workforce and of its skills. We have 55 years of experience in internal combustion, we have zero employees with expertise in electrical vehicle construction and chemical engineering, we have to reskill our employees."

Source: executive of an Automotive sector company, operational perspective

The current trends bring significant challenges both for the employers and for the employees. Each group must accept the implications of the changes and how the concept of labour will look in the future.

Table 6: The challenges for the adoption of technology within the organisation

Automotive Sector	Oil & Gas Sector
Employees' resistance to change.	The reluctance to change in a traditionally conservative industry, which relies on manual work, also fueled by the fear of losing the job.
Lack of the skills required by new technologies.	The poor training and instruction of the employees, also including the development of digital expertise of the workforce.
Difficulty in adapting to the new digital rquirements, especially within certain demographic categories of personnel.	The speed of adapting the workforce to the new requirements especially where technology replaces repetitive work.
Lack of alignment between the educational system, whose offer is not in line with the new technology, and the needs of the organisations, which calls for the companies' need to significantly invest in the development of skills, mainly of technical skills.	Organisational culture – although there is an awareness about the importance of digitalisation and automation, there is a need to better anticipate and plan the long-term impact on the workforce.
Difficulties in retaining the already trained employees, who become more attractive on the labour market.	Insufficient internal resources
Increased complexity of products and services with consequences on the necessary skills.	The trend to digitalise existing processes rather than rethinking them as digital processes with new flows.
From an external point of view, the acceptance by customers of the electrical vehicles with batteries and the existence of the supporting ecosystem (charging stations, their maintenance, etc).	The dependence on technology and the cyberspace security.
The existence of several generations within the workforce: • *The new generations favour accelerated promoting opportunities, salary rises, increase of responsibilities.* • *Older employees are more conservative and adapt with difficulty to the new digital requirements.*	The high average age in parallel with a lower adapting capability of these generations, but which is balanced by experience.

Source: interviews with the executives of Automotive and Oil & Gas sector companies in Romania, February – March 2022

3.2. The impact of technological evolution on the Automotive and Oil and Gas industries

Against the background of the changes generated by the technology evolution, both the global researches and the results of the study carried out in the Automotive and Oil and Gas sectors in Romania estimate a **dynamics of the importance of the employees' skills required to perform their activities in the future as compared to present day**, some skills becoming more and more important while others becoming less and less necessary.

3.2.1. The skills to grow in importance due to the technology evolution

The study carried out in the Automotive and Oil and Gas sectors in Romania confirm the global trends with regard to the emerging skills. Thus, **both sectors estimate that digital skills shall have the greatest growth in importance,** as they assist the usage of various software programmes and applications in performing the specific activities, in analysing and extracting relevant information from the big data and in generating predictions.

The Automotive Sector

Here are the skills to grow in importance as resulted from the interviews made with the executives in the Automotive sector companies:

- There is an increase in the need for the skills of data processing and synthesizing, of integrating and correlating the information from various sources (production, equipment, logistics), as the number of implemented systems increase and a significant volume of information is generated;
- The new trends aiming at the gradual replacement of the mechanical engine with the electrical one call for a greater need for knowledge and skills in the chemical and electrical engineering areas as well as skills for using software applications;
- The robotisation of production lines increases the need for specialised operators with supervising, monitoring and controlling skills.

According to the opinions voiced by the supervisors of the analysed jobs in the Automotive sector, some nowadays important skills shall continue to be important in the future as well, such as the **orientation towards the customer, the identification of problems, the management of material resources**.

Furthermore, some skills shall significantly grow in importance in the next period, such as: **the use of software, the solving of complex problems, the system analysis** (the capability to establish how a system should work and how the change of the conditions, operations and environment shall affect the results), as well as the operation control skills on equipment or systems.

Moreover, after the physical, routine activities are taken over by technology, the **social skills** of training and developing the new colleagues, of introducing with impact and conviction are expected to grow in importance, as well as the skills associated with the active pursuit of ways to assist others.

Table 7: The top of the skills with the greatest growths in importance in the future as compared to the present, in the context of the technological evolution, in the Automotive sector

1.	Use of software
2.	Solving of complex problems
3.	System analysis
4.	Operation and control
5.	Installation
6.	Training
7.	Orientation towards the customer
8.	Persuasion
9.	Information organisation
10.	Technological designing

Source: The perspective of the direct supervisors of analysed jobs

From the employees' perspective, the importance degree in the future of the analysed skills is different depending on the job family for which the skills are relevant. Thus, there are cases when the skills have different trends, of increasing or decreasing their importance in the future depending on the job family.

Table 8: The top of the skills to grow in importance in the future in the context of the technological evolution, in the Automotive sector

	Skills	*Job families*
1.	Deductive reasoning	Support and administrative operations, Geology and exploration, Control and Dispatch
2.	Monitoring of the performance	Geology and exploration, Support and administrative operations, Control and Dispatch
3.	Flexibility	Geology and exploration, Support and administrative operations
4.	Inductive reasoning	Geology and exploration, Support and administrative operations, Control and Dispatch

Source: The perspective of the Automotive sector employees

The Oil and Gas Sector

With regard to the skills to grow in importance, the executives of the Oil and Gas sector companies participating in the study mention the following:

- The technology evolution shall generate new, *agile*-type working ways, which call for the development of new skills
- In the context of technologisation, communication shall be very important, and the soft skills in general may be even more important than the specialised skills
- *Data analytic / data science* skills shall be required in order to make best use of the large volumes of available information
- Among the relevant skills in the next period there are emotional intelligence, critical thinking / analytical thinking / systemic thinking, flexibility, overview, adaptability, solving of complex problems

According to the direct supervisors of the jobs analysed in the study for the Oil and Gas sector, some skills that are significantly important in the present shall remain significantly important in the future as well, such as **communication, active listening, problem identification,** active learning, critical thinking, flexibility. Also, some skills shall greatly increase in importance, such as **the use of software, system evaluation, scientific approach,** identification of performance indicators and of the actions required for the performance improvement or correction, both for own activity and for the systems used, the use of rules and scientific methods in solving problems. Is is also envisaged a significant evolution of the importance of the time, resource and team management skills, which have an impact on the efficiency and efficacy of the organisation.

Table 9: The top of the skills with the greatest growths in importance in the future as compared to the present, in the context of the technological evolution, in the Oil and Gas sector, from the perspective of the direct supervisors of analysed jobs

1.	Use of software
2.	System evaluation
3.	Scientific approach
4.	Material resource management
5.	Monitoring of the performance
6.	Training
7.	Inductive reasoning
8.	Active learning
9.	Problem identification
10.	Time management

From the employees' perspective, the skills to grow in importance in the future are relevant mainly in the following job families:

Table 10: The top of the skills to grow in importance in the future in the context of the technological evolution, in the Oil and Gas sector

	Skills	*Job families*
1.	Deductive reasoning	Support and administrative operations, Geology and exploration, Control and Dispatch
2.	Monitoring of the performance	Geology and exploration, Support and administrative operations, Control and Dispatch
3.	Flexibility	Geology and exploration, Support and administrative operations
4.	Inductive reasoning	Geology and exploration, Support and administrative operations, Control and Dispatch

Source: the perspective of the Oil and Gas sector employees

3.2.2. The skills declining because of the large-scale adoption of technology

According to the study, the skills expected to decrease in importance in both sectors because of technology evolution are those involving **manual skills**, as well as **the collecting, managing, handling, data processing and reporting skills** or those on which repetitive activities are based.

Moreover, the comparative analysis of the opinions voiced by the employees in the two sectors reveal that they, too, consider that some skills shall lose their importance in the future in both sectors, such as **operation monitoring and performance monitoring.**

The Automotive Sector

Here are the skills expected to decrease in importance in the Automotive sector because of the technological developments: the capability of spatial orientation, of seeing at different distances and of differentiating colours, the capability to quickly and clearly compare the similarities and the differences between sets of letters, numbers, objects, images or patterns, to make precisely coordinated movements of the fingers of one or both hands in order to catch something, or of the entire body, the capability to handle or assembly tiny objects.

Table 11: The top of the skills with the greatest decreases in importance in the future as compared to the present, in the context of the technological evolution, in the Automotive sector, from the perspective of the direct supervisors of analysed jobs

1.	Spatial orientation
2.	Visual acuity
3.	Perceptual speed
4.	Responsiveness
5.	Colour differentiation
6.	Concentrated attention
7.	Dexterity, precision / body coordination

In the employees' opinion, the skills to significantly decrease in the Automotive sector are: **Visual acuity, Communication, Order control**, mainly in certain job families for which the skills are relevant.

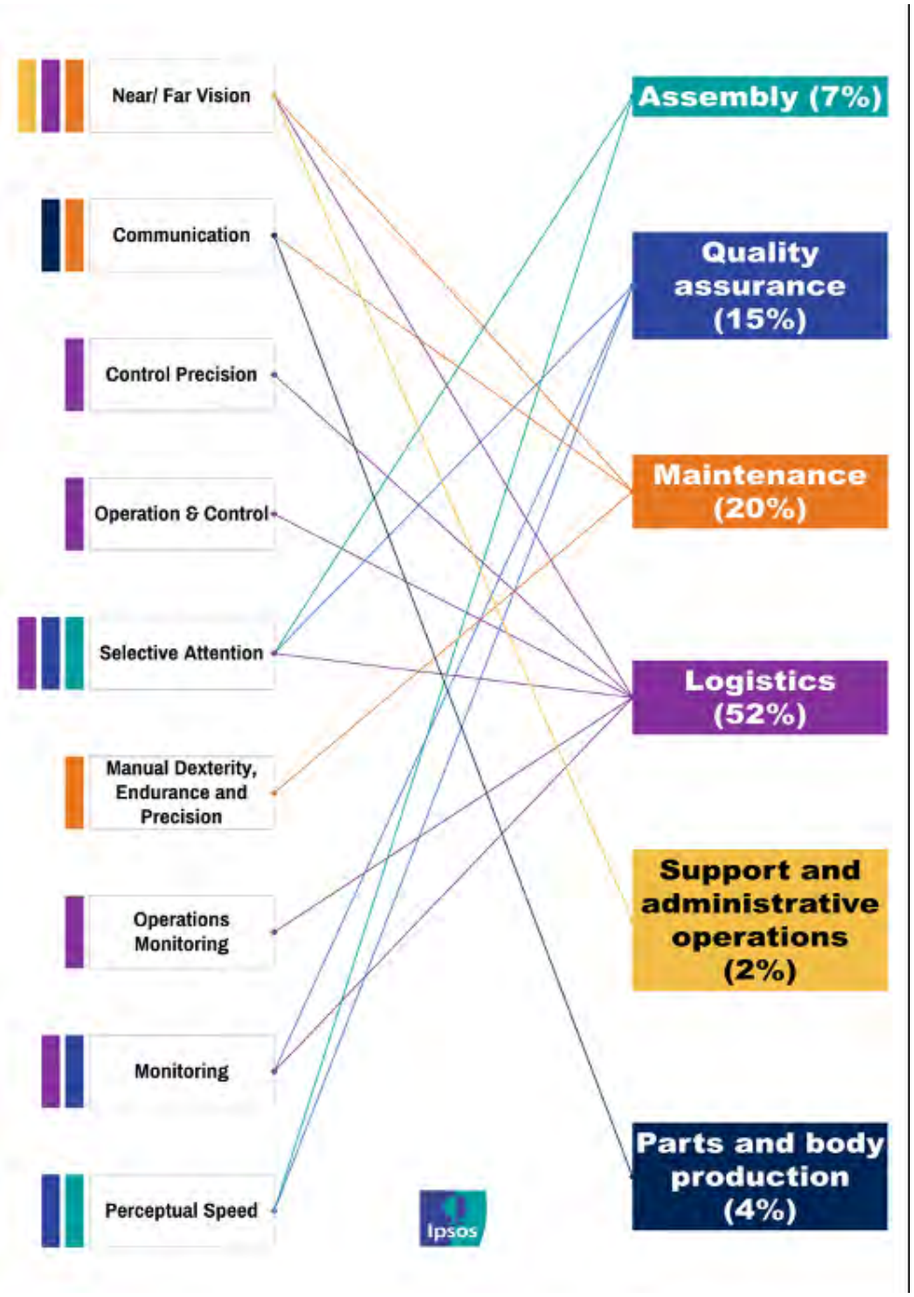
Table 12: The top of the skills with the greatest decreases in importance in the future as compared to the present, in the context of the technological evolution, in the Automotive sector, from the employees' perspective

	Skills	*Job families*
1.	Visual acuity	Logistics, Maintenance, Support and administrative operations
2.	Communication	Maintenance, Production of car parts and body
3.	Order control	Logistics
4.	Operation and control	Logistics
5.	Selective/concentrated attentior	Logistics, Assembly / Installation, Quality assurance
6.	Dexterity / precision / body coordination	Maintenance
7.	Operation monitoring	Logistics
8.	Performance monitoring	Quality assurance, Logistics
9.	Perceptual speed	Assembly / Installation, Quality assurance

The taking into consideration of the skills to decrease in importance (as per the employees' opinions) and the relevance thereof for the analysed jobs reveal that certain jobs and job families, respectively, shall be more affected by the dynamics of the skill importance. Therefore, the jobs in the **Logistics, Maintenance** and **Quality assurance** families require nowadays many of the skills which are expected to become less important in the future, which increases the exposure of such job families to the transformations generated by the technology evolution.

According to the employees' opinion, the Assembly / Installation, Support and administrative operations, and Production of car parts and body job families showed a low exposure as regards the relevant skills to lose their importance because of the technological advance. The lowest exposure was with the Dyeing job family, which registered no relevant skill as being less important in the future.

Graph 2: The impact of the less important skills in the future on the job families in the Automotive sector



Here are some of the jobs that are mostly affected by the skill importance dynamics (e.g.: the decrease in importance of the operation and control skills, visual acuity or order control):

Table 13: List of jobs with the skills having greatest decreases in importance in the Automotive industry

Job family	*Jobs*
Logistics	Driver, computer operator, lift truck operator, mobile machine operator, material and equipment reception and supply operator
Maintenance	Mechanic fitter
Quality assurance	Quality inspector / specialist / analyst

Source: the employees' perspective

The Oil and Gas Sector

From the perspective of the direct supervisors of analysed jobs for the Oil and Gas sector, no skill was expected to become less important in the next period.

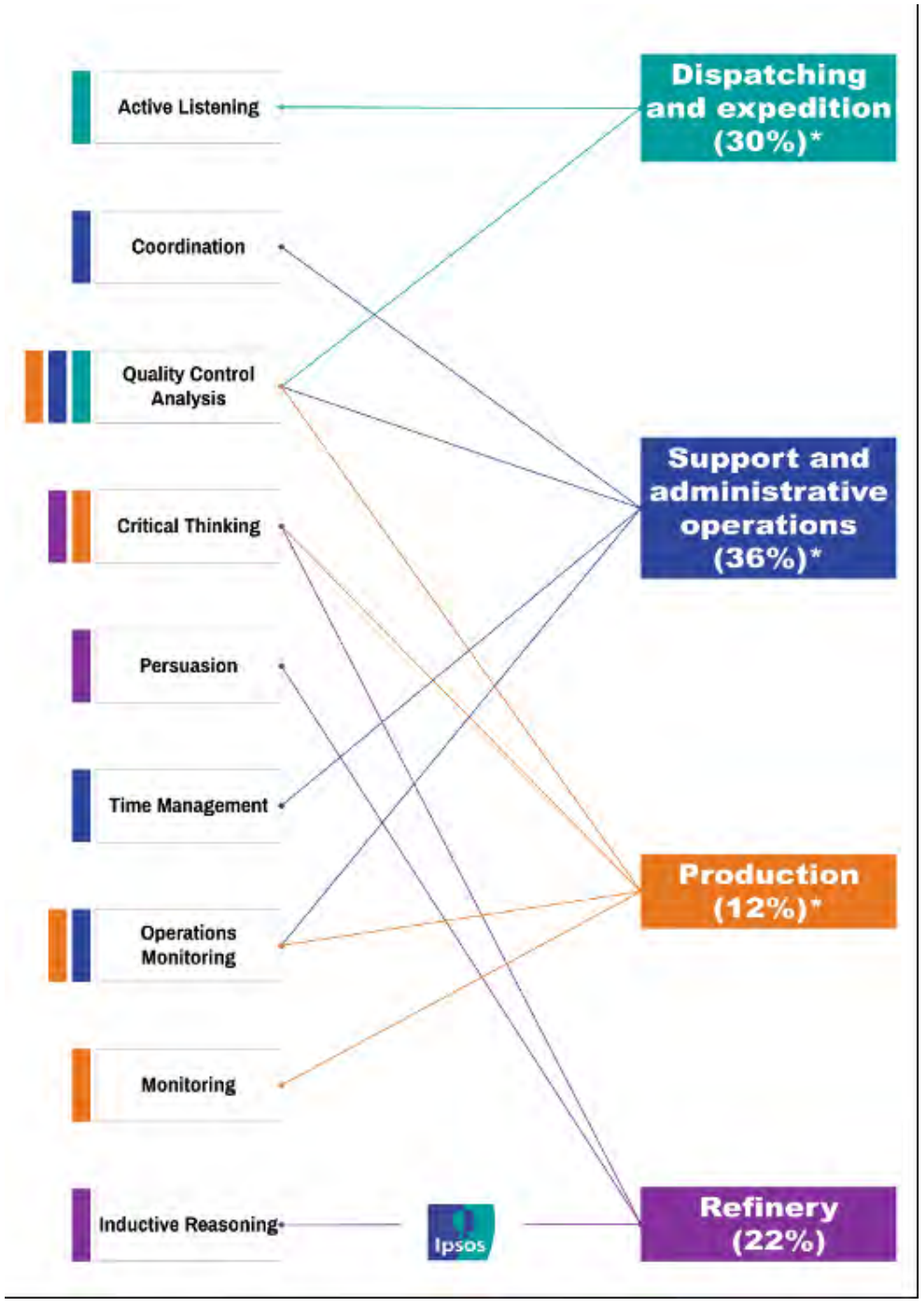
However, in the employees' opinion, 18 skills shall see a decrease in importance, among which **active listening, coordination, quality control analysis** have the greatest decrease, in the following job families:

Table 14: The top of the skills with the greatest decreases in importance in the future as compared to the present, in the context of the technological evolution, in the Oil and Gas sector, from the employees' perspective

	Skills	*Job families*
1.	Active listening	Control and Dispatch
2.	Coordination	Support and administrative operations
3.	Quality control analysis	Support and administrative operations, Control and Dispatch, Production
4.	Critical thinking	Refining, Production
5.	Persuasion	Refining
6.	Time management	Support and administrative operations
7.	Operation monitoring	Support and administrative operations, Production
8.	Performance monitoring	Production
9.	Inductive reasoning	Refining

Therefore, in view of the relevant skills to decrease in importance in the future because of the technological advance (according to the employees' opinion), the **Support and Administrative Operations, Control and Dispatch** and **Refining** job families shall be mostly affected by such dynamics. The Production job family, although associated with some skills due to decrease in importance in the future, registered a low exposure, while the Geology and Exploration job family does not have any relevant skill to decrease in importance.

Graph 3: The impact of the less important skills in the future on the job families in the Oil and Gas sector



Source: the perspective of the Oil and Gas sector employees

**Because of the low number of interviews related to those job families (under 30), we recommend caution in interpreting the results*

Here are the jobs which are mostly influenced by the skill importance dynamics and which have associated skills that were identified as less important in the future than in the present, such as quality control analysis, active listening, persuasion, operation monitoring or performance monitoring:

Table 15: List of jobs with the skills having greatest decreases in importance in the Oil and Gas industry

Job family	*Jobs affected by the skill importance dynamics, within the job family*
Support and administrative operations	Customer services analyst, quality specialist
Control and Dispatch	Dispatch Operator, Dispatch Shift Leader
Refining	Refining chemical foreman
Production	Gas extraction operator

Source: the employees' perspective

Annex 1 presents a comparative image of the skill importance dynamics in the context of technology evolution, both from the perspective of the employees participating in the study and from the perspective of the direct supervisors of analysed jobs and of global prognoses .

3.3. The impact of technical evolution on the skills in the Automotive and Oil and Gas industries

The signals from the interviews made as part of the study with executives in the Automotive and Oil and Gas sector companies in Romania show that:

- Most transactional tasks shall reduce and be taken over by technology, which shall entail simplified working procedures;
- There shall be a decline in the jobs involving unqualified work or requiring low qualification, which shall entail reskilling and transition-supporting actions;
- The help-desk, user / customer support activities shall transit towards self-service platforms or robots, while the interaction with customers shall move towards the use of platforms (i.e. CRM-type) and various digital applications;
- New jobs in the database administrator / data analyst / data scientist areas shall be included more frequently in the companies, bringing value by interpreting data, generating predictions and using the results rather than by data collecting, transmitting and processing;
- Digitalisation is expected to act as a "competitiveness driver" for the new generations and to increase the attractiveness of the jobs in the so-called heavy industry by adopting modern working methods ;
- It is highly probable that the data access shall change the dynamics in companies; a flattening of the organisational structure is o expected due to digitalisation, the line managers having direct access to information and being able to directly exploit data.

Expectations are that, as the technology develops and the tasks change, certain jobs shall be affected, although this impact is not considered as significant in the short-medium term.

The jobs with a greater exposure to the technology evolution, as identified by the direct supervisors of the jobs in both sectors, are those involving highly predictable and repetitive duties, the handling of well defined and clear information sets which require such duties that can be easily taken over by machines, applications, robots.

The Automotive Sector

The duties of the jobs analysed in the Automotive sector, identified as having a higher exposure risk to technology, are:

- simple operations involving manual dexterity, motricity (select, catch, move, fix, fasten, apply)
- operations for the dyeing of various components
- visual inspection activities, parts quality control (geometry, scratches, manufacturing defects) and minor finishing, correcting and tuning operations
- checking of system operability / parameters
- parts management actions (handling, line loading / supply, stock inventory, replacement of parts)
- data operation, fulfilling of information on paper or in the system

Source: The opinion voiced by the direct supervisors of analysed jobs regarding the duties with the greatest exposure risk

Therefore, according to the opinions voiced by the direct supervisors of analysed jobs, some jobs are more exposed and potentially more vulnerable to technology: **Production of car parts and body, Logistics, Car Dyeing, Maintenance** as well as **Quality Assurance.**

The high exposure is due in particular to the great repetitiveness of duties, to the very good physical shape required for the fulfilment of duties as well as to a high job-associated risk. Moreover, the job supervisors consider that a large part of the job duties can be taken over by the new technologies that will be implemented, with benefits as regards the product and service quality and the customer relationship.

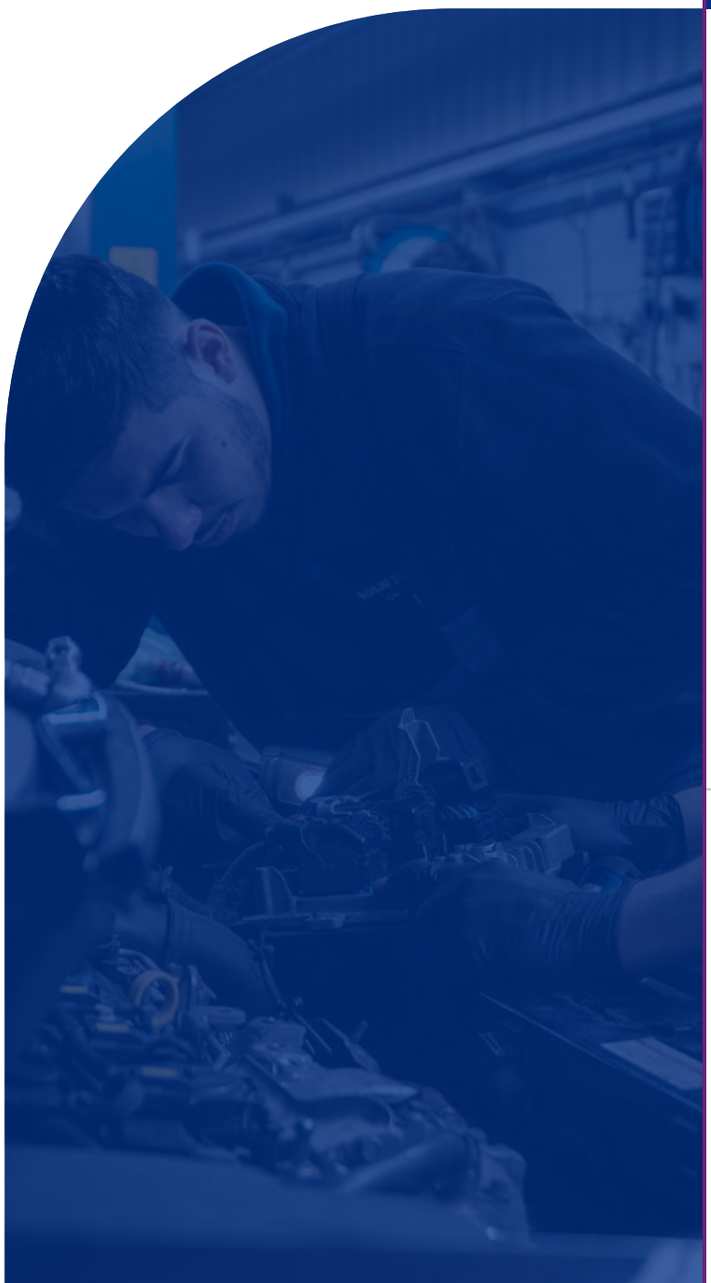


Table 16: Estimated exposure of the Automotive sector job families to the technology impact

Job family	*Exposure level*	*Jobs analysed within the job family*
Dyeing	High	Dyer, Dyeing line operator (preparation, tuning, application of elements)
Support and administrative operations	High	Administrative and assistance clerk / secretariat
Production of car parts and body	Medium-Significant	Sheet-metal worker, installation conductor, founder-moulder, bridge crane attendant, welder, cold metal pressman, sandblast cleaner, industrial robot operator, mechanical processing operator, jobs associated with a good physical shape and with high risk level
Quality assurance	Medium-High	Quality inspector / specialist / analyst
Maintenance	Medium-High	Maintenance specialist, electrician, mechanic fitter, die-maker, maintenance operator, automation specialist, jobs also involving tasks with a medium-to-high risk level.
Logistics	Medium-High	Machine operator, logistics operator, computer operator, manual packaging / bagging operator, lift truck operator, driver, production management technician, production line operator, technical equipment preparation operator, jobs associated with a good physical shape and high risk level
Assembly / Installation	Medium	Installation operator, final inspection operator

Source: The perspective of the direct supervisors of analysed jobs

The interviewed executives also expect some changes in the medium term, as regards both the production line jobs and the *white collars* jobs:

- In the medium term, the production line operators shall move towards robot supervision and control activities, and they shall migrate to roles as automatician and robotician
- The logistics area shall see significant transformations as the QR-code reading drones are used on a larger scale
- The employees in the support jobs shall move from repetitive, routine activities such as data operation and processing towards added-value activities (e.g. from an accountant to a financial controller, from a human resources administrative worker to a HR business partner)
- The jobs of automatician and robotician are among the jobs which shall significantly increase due to the technological evolution
- The employees whose jobs do not require qualification can move to the jobs in the packaging services area, the part selecting services or cleaning services
- The employees in the mechanic engineering area can move to jobs in car service units, where their skills shall prove very valuable

The Oil and Gas sector

The duties of the jobs analysed in the Oil and Gas sector, identified as having a higher exposure to automation and digitalisation, are:

- the collection and analysis of ob-site samples
- the thermal and chemical treatment of petroleum
- the inspection, checking, measuring, monitoring and control of process or equipment operating parameters, including the measuring of volumes and flows
- the performance of operations according to working instructions
- the receiving and sending of on-site information (including failures), the introduction and processing of primary data in applications, preparation and listing of reports
- the maintaining of the system interface operability

Source: Opinion expressed by the direct supervisors of analysed jobs with regard to the duties with the highest exposure risk

Therefore, in this sector, too, some jobs are more exposed and potentially more vulnerable to technology. Based on the opinions expressed by the direct supervisors of analysed jobs, the research revealed that the job families with a high and significantly high exposure are **Refining**, **Refining optimisation, Production** and **Production optimisation**. The exposure rate is given by the volume of repetitive, predictable duties of the jobs in these families, by the high risk level associated with the performing of activities and by the transparency and definition of the collected, processed information.

Table 17: Estimated exposure of the Oil and Gas sector job families to the technology impact

Job family	*Exposure level*	*Jobs analysed within the job family*
Refining	High - Significant	Refining chemist, by different senior levels whose exposure is influenced by the significant-high risk level associated with the activities.
Refining optimisation	High	Process improvement specialists and experts, who got high scores at all evaluation criteria
Production	High	Gas and petroleum extraction operators; these jobs are considered as requiring a good physical shape
Control and Dispatch	Medium - High	Dispatch operator and dispatch shift leader
Geology and exploration	Medium - High	Geologist, geophysicist, sedimentologist
Production maintenance	Medium - High	System, instruments and automation engineers, corrosion engineers, production conditions treating and monitoring operators; these jobs are considered as having a high risk associated with activities and a medium-high risk associated with the required physical shape
Support and administrative operations	Medium - High	Financial analyst, customer service analyst, administrative experts or human resources experts; the automation of these activities is considered as bringing organisational benefits such as efficiency, quality, customer satisfaction
Production optimisation	Medium - High	Programming, optimisation, automation engineers (different from those in the Maintenance area), engineers in charge with the production supervision and artificial lifting

Source: The perspective of the direct supervisors of analysed jobs

The interviewed executives in the participating companies express their expectations with regard to the effects the dynamics of activities and duties shall have on jobs in the medium-long term:

- By re-technologisation, the current activities shall move towards activities which bring added value to operations, with impact on quality and efficiency (for example, the predictive maintenance), and which shall encourage the reduction of the risk associated with the performance of activities
- It is expected that the repetitive activities in the production area be automated and taken over by sensors, whereas the information collection and transmission be made by various applications
- The help-desk, user support activities shall move towards self-service, and the interaction with the customers - towards the use of chatbot-type digital platforms and applications
- The control activities, which involved the physical presence before the pandemic, shall migrate towards a digital monitoring of flows by making use of the technology
- By introducing augmented reality, the activities such as on-site inspection, monitoring, testing shall be able to interpret the collected data, while the on-site activity shall be monitored from the headquarters by means of the digital platforms
- The jobs in the logistics and dispatch area, which involved manual numbering and labeling activities, shall migrate towards GPS monitoring activities, drone-assisted surveillance and analysis of the automatically generated reports
- The activities in the geology and exploration sectors as well as the production operator ones shall be influenced by the technological progress in the long term
- New jobs shall appear regularly due to the transformation of the operational flows and processes within companies, the repetitive activities in the production area shall be automated and taken over by sensors, the collection and transmission of information shall be made with the help of the technology

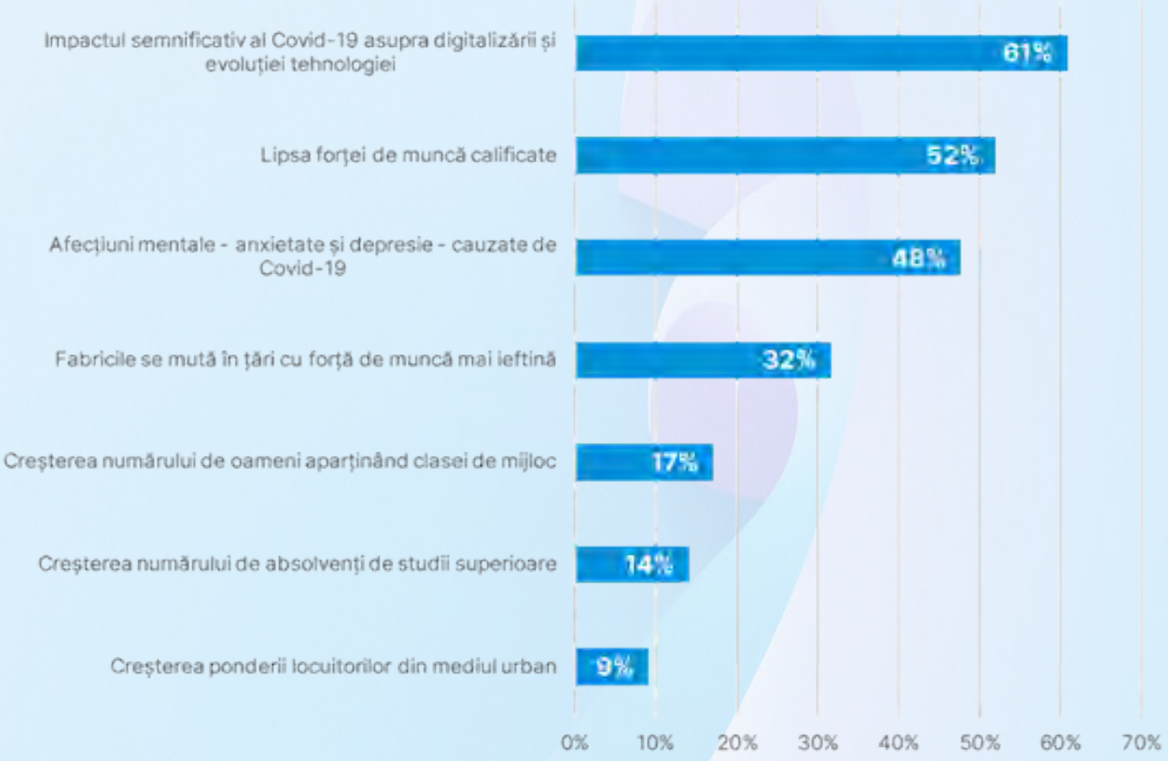
3.4. The employees' perspective on the general impact of the technology evolution

The employees in the two industries are aware to a great extent of the changes taking place in the world in general and in their industry in particular. At the same time, however, they are concerned about the impact of such changes on them, as individuals and as employees.

The research revealed that 6 out of 10 employees agree that the COVID-19 pandemic had a significant influence on the technology and digitalisation evolution, pointing out the lack of qualified workforce. Ranking third is their concern over the mental disorders (anxiety and depression) caused by the pandemic.

As regards the demographic differences, the analysis revealed that the impact of the Covid-19 pandemic on the technology development was felt mainly by the employees with higher education, by the employees aged 55-64, as well as by those considering that the change rate in the industry is too rapid. The lack of qualified workforce is noted in particular by the employees with secondary and higher education and by the men, whereas the higher-educated employees and the women note the increase in mental disorders.

Graph 4: The trends accelerated by the COVID-19 pandemic



Source: the perspective of the Automotive and Oil and Gas sectors employees (N=1713).

The employees' perception with regard to the impact of the Covid-19 pandemic on digitalisation and technology evolution is stronger in the Oil and Gas industry (79%) as compared to the Automotive industry (60%). As regards the deployment of factories to countries with a cheaper workforce, 1/3 of the Automotive industry employees are worried about it.

Although the share of the interviewed higher-educated employees is similar for the two industries, in the Oil and Gas sector there are more employees with lower secondary studies (10% as against 3%) and vocational studies (31% as against 23%), respectively a greater share of the employees with upper secondary studies in the Automotive industry (50% as against 35%).

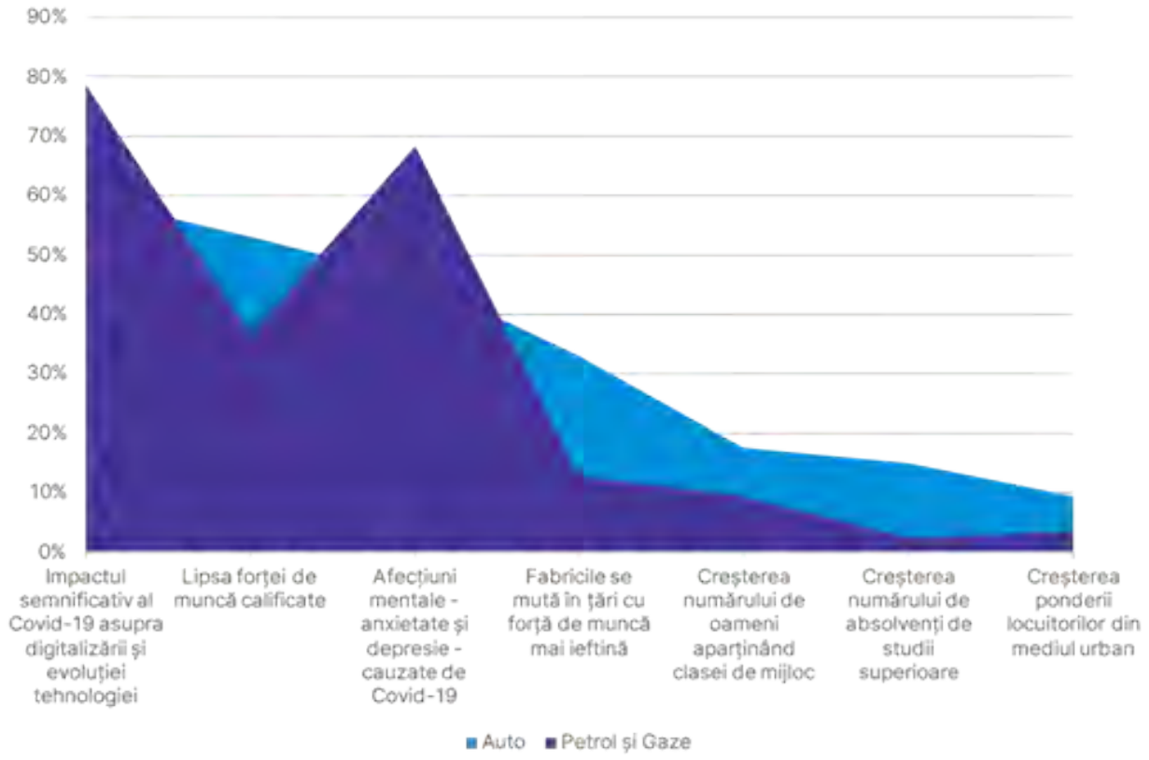
Employees in the automotive sector agree to a higher extent compared to employees in the oil & gas sector with several tendencies potentially accelerated by the pandemics, such as:

: increased proportion of higher education graduates (15% vs 3%), increased urban population (10% vs 3%), increased middle class population size (18% vs 9%). At the same time, still employees in the automotive sector complain about the lack of qualified workforce to a higher extent compared to the oil & gas employees (53% vs 37%).

The employees in the Automotive industry feel that the technology influence is more present in their industry as compared to the Oil and Gas employees (61% of the Automotive industry employees think that the changes are already present in their industry as compared to 53% of the employees of the Oil and Gas sector).

At a personal level, **the Oil and Gas employees are significantly more concerned over the increased incidence of mental disorders caused by the Covid-19 pandemic** (69% as against 46% of the Automotive industry employees).

Graph 5: The trends accelerated by the COVID-19 pandemic



Source: the perspective of the Automotive and Oil and Gas sectors employees (N=1713).

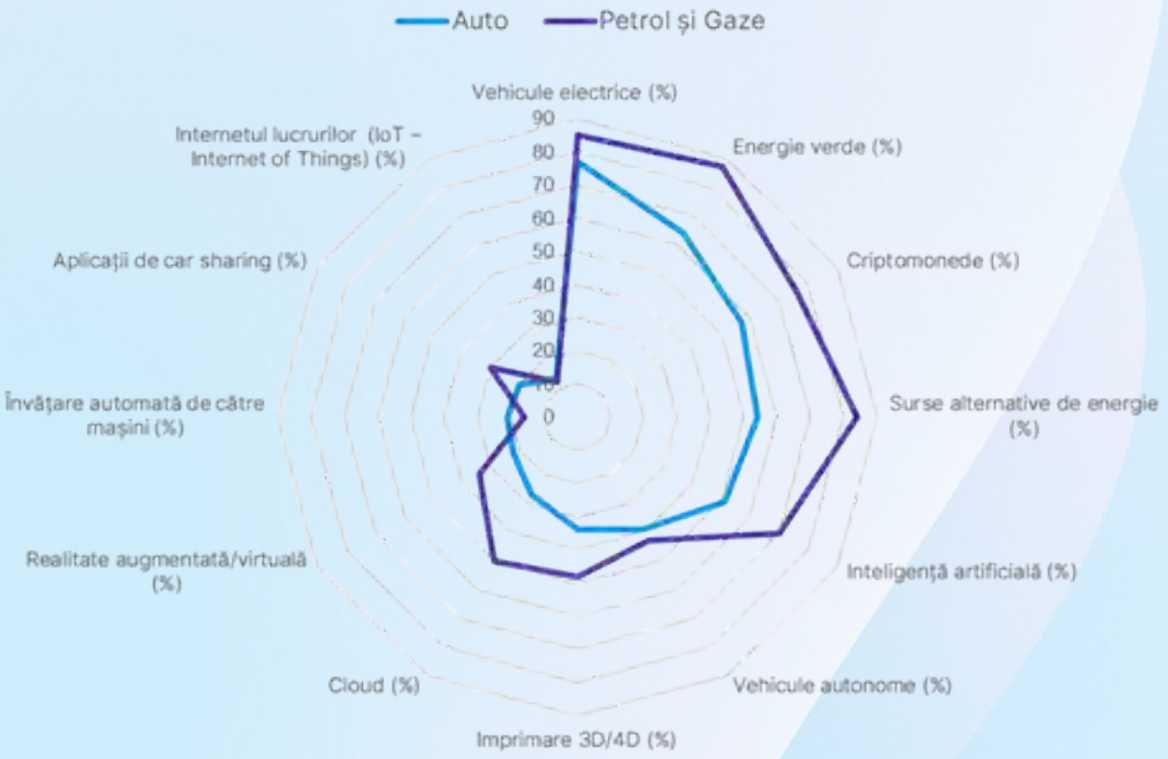
The employees are familiar both with the general notions of technology and with those that may be associated with their professional sphere.

The employees were also asked about their familiarity with certain current notions which can prove both their attention and openness for technology, and their openness for learning new notions, as a first step towards actually working with such notions and putting their new knowledge into practice.

So, **electrical vehicles (78%), green energy and cryptocurrency are the most familiar notions of the interviewed employees**, no matter the industry they are working in. The least familiar is IoT (Internet of Things), with 13%.

With just a few exceptions, the employees in the Oil and Gas industry are better informed about the new technology and digitalisation concepts in the public space nowadays.

Graph 6: Employees' familiarity with the current notions and terminology associated with the technological development



Source: the perspective of the Automotive and Oil and Gas sectors employees (N=1713)

From socio-demographic point of view, we can note a higher familiarity with the new notions among the higher-educated employees, among the men and among the employees aged 25-34, respectively 55-64, much more so as the qualitative analysis of the supervisors' interviews revealed that the use of software is the most important skill for the future both in the Automotive industry and in the Oil and Gas sector.

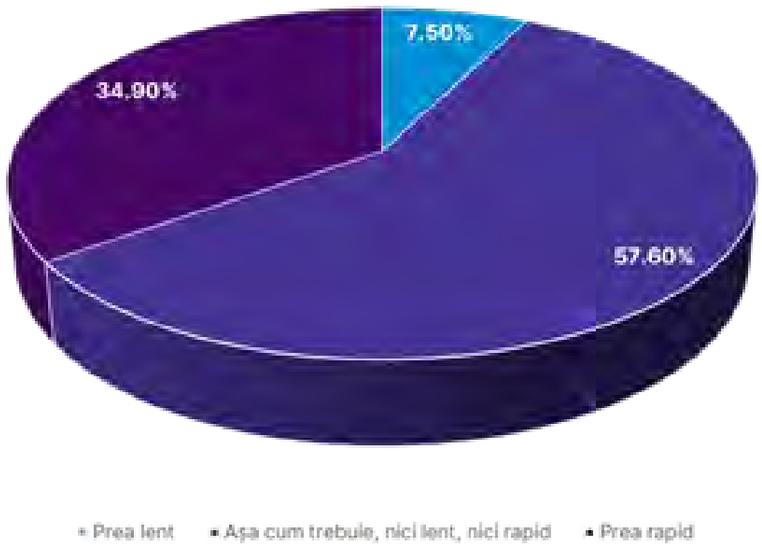
Table 18: Demographic details regarding the familiarity with the current notions and terminology associated with the technological development

	Nivel de educație			Gen		Vârstă				
	Scăzut	Mediu	Ridicat	Bărbați	Femei	18-24 ani	25-34 ani	35 44 ani	45 54 ani	55-64 ani
Număr mediu de mențiuni	3.0	4.6	6.1	5.1	4.7	4.2	5.3	4.6	4.9	5.4

Source: the perspective of the Automotive and Oil and Gas sectors employees (N=1713)

1/3 of the employees consider that the rate of the changes caused by technology is too rapid. Asked how quickly they consider such changes are taking place technologically in the industry they work in, more than half of the employees in the analysed jobs (58%) see the changing rate in their industries as moderate. However, more than one third (35% think the pace is too rapid; only 8% of the Automotive and Oil and Gas employees consider that the pace is too slow.

Graph 7: The rate of change



Source: the perspective of the Automotive and Oil and Gas sectors employees (N=1713)

There are, however, notable differences between the industries. Thus, only 5% of the Oil and Gas employees see the rate of the changes as too rapid, as compared to 37% of the Automotive sector employees. A moderate rate of the changes caused by the technological advance is seen by 72% of the Oil and Gas employees as compared to 57% of the Automotive sector employees. Finally, 23% of the Oil and Gas employees would like that the changes brought by technology take place more quickly in their field of activity, as compared to only 6% of the Automotive area employees. From a demographic point of view, the people more attracted by a quicker development of their industry based on technology are the youngsters (aged 25-34) and the lower-educated persons.

The increase in the demand and the technological evolution are the most important changes in their industry, as mentioned by the employees

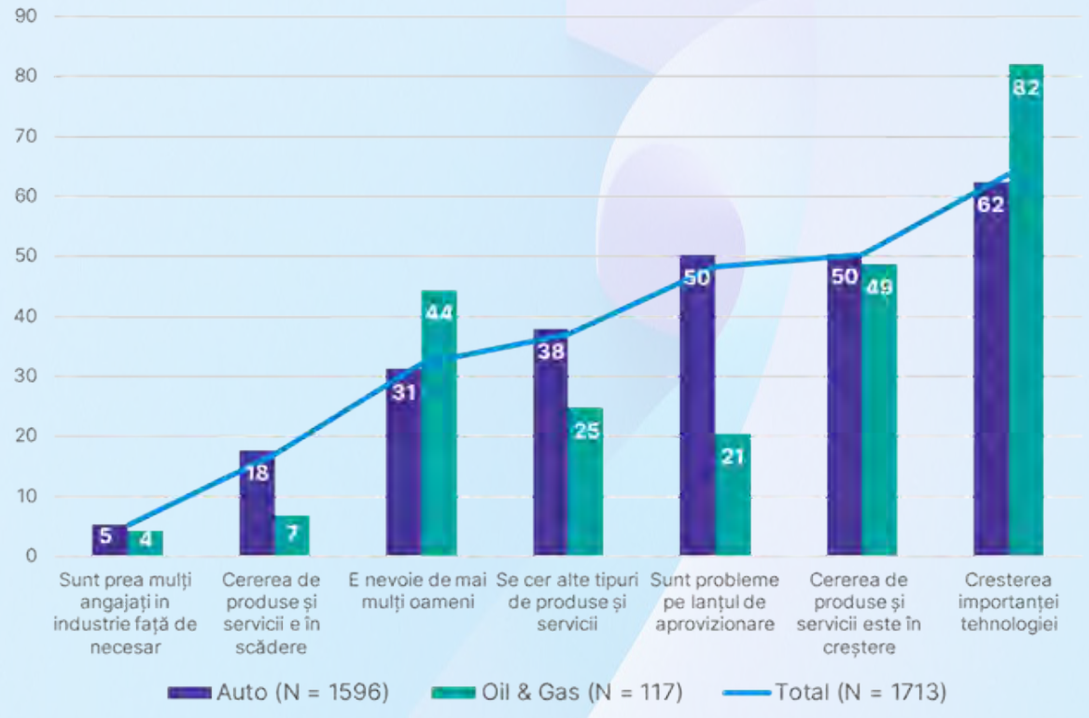
From general to particular, the respondents were asked about the concrete changes in the industry they are working in, besides the perspective of the technological evolution. Per total, **most of the employees (95% do not agree that the changes at the industry level also include the fact that not all the current employees are necessary**.

The importance of the technology represents a visible change, with which 64% of the employees in the two industries agreed.

Although the employees in both industries think that the areas they are working in still remain relevant, the answers of the two groups of employees differ in several aspects, as follows:

- The workers in the Automotive industry consider that the technology is important (62%), but they are concerned both over the supply chain problems (most probably the semiconductor crisis) -> 50%, and over the relevance of the products in the current portfolio (38%) and over the decline of demand (18%).
- On the other hand, the Oil and Gas employees think that technology is much more important (82%), that it is necessary to diversify the product portfolio (25%) and that their industry further needs workforce. Unlike the employees in the Automotive industry, only 7% of the workers in the Oil and Gas industry consider that their industry is facing a decrease in the market demand.

Graph 8: The changes caused by technology



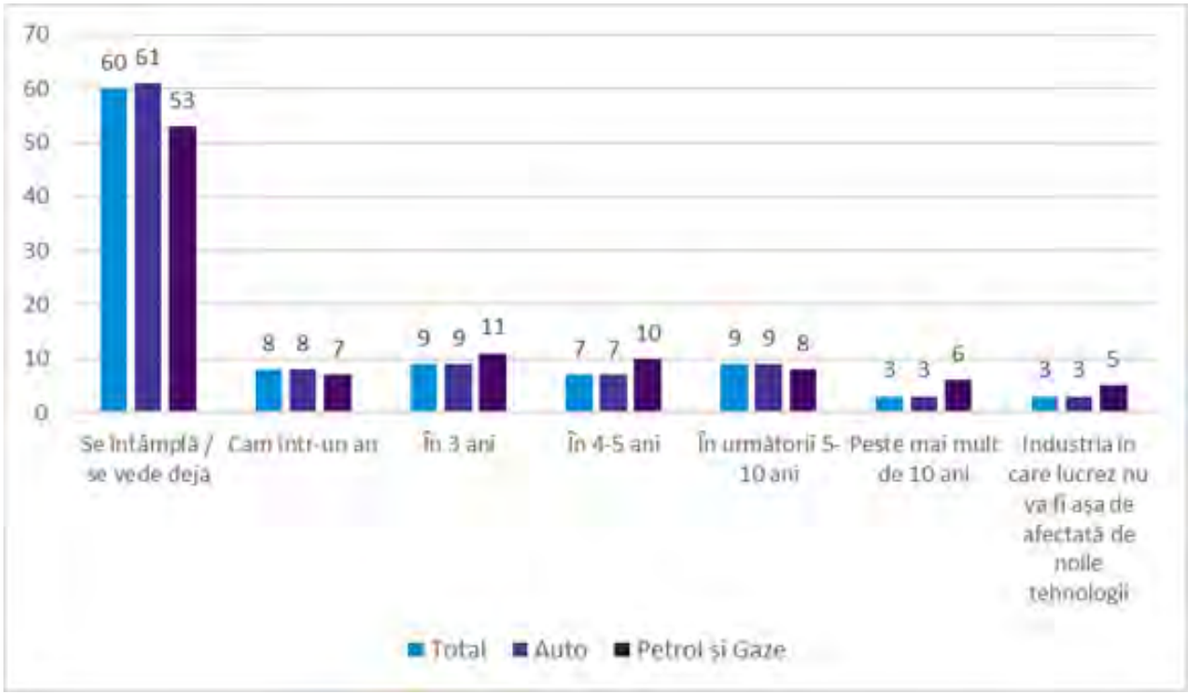
Source: the perspective of the Automotive and Oil and Gas sectors employees

From a demographic perspective, the women think to a greater extent than the men that more employees are needed in their industry (35% as against 29%).

Six out of ten employees in the two industries agree that the changes in their field of activity are already visible and present.

Even if over half of the respondents agreed that their industries are already changing, the study revealed that the time horizon of change is different for each employee and each industry, and the perception of the imminent changes is nuanced. A relatively residual percentage (3% each) consider that the changes shall be waited for more than ten years, respectively that they shall not greatly influence their field of activity.

Graph 9: The perception about the time horizon of the change



Source: the perspective of the Automotive and Oil and Gas sectors employees

From the demographic point of view, the analysis by the level of education reveals differences. Thus, the low-educated employees think that the changes are not yet visible in their industry (64% as against 36% for the higher-educated employees).

The great majority of the employees in both industries (97-98% are aware of the benefits of the technological progress in their work.

From their perspective, some of the main benefits of the accelerated technological development are: **the improvement of productivity, the reduction of the physical effort, the reduction of the operating time,** the taking over of the harder or more dangerous work, as well as the contribution to the production of more technologically advanced products and services.

However, the perspective at the industry level is different:

- The employees in the Automotive industry consider, to a larger extent, that the benefits of the technological development cover the performance of the more difficult or more dangerous work, as well as the need for the people to learn how to build new things, while the robots shall take over the human current activities.
- The employees in the Oil and Gas industry are to a larger extent aware of he benefits associated with the improvement of productivity or the contribution to the production of more technologically advanced products and services.

Table 19: The benefits of the accelerated technological development

Which are in your opinion the benefits of the accelerated technological development in your industry? Tick the options in line with your opinion. Multiple answer.	**Automotive** (%)	**Oil and Gas** (%)
Improvement of productivity	59	74
Reduction of the people's physical effort	54	50
Reduction of the operating time	45	52
Carrying out of harder activities instead of the people	38	16
Contribution to the production of more technologically advanced products and services	33	45
Carrying out of the more dangerous activities instead of the people	34	15
People shall no longer be needed to fulfil certain tasks	22	21
From now on the people should learn how to make new things and the robots should do what people are doing now	22	13
More people shall be needed because the tasks shall be more complex and the machines need to be supervised	10	13
It helps youngsters in particular	10	14
It helps older people in particular	9	7
I see no benefit of the technological progress in my work	3	2

Source: the perspective of the employees in the Automotive (N=1596) and Oil and Gas (N=117) sectors. The highlighted areas show major differences between the industries. (95% confidence level).

Significant differences can be noted in certain demographic segments:

- The persons aged 55-64 consider to a larger extent that the benefits of the technological progress depend on the productivity improvement (72%), on the reduction of the operating time (57%), on the contribution to the production of more advanced products and services (42%).
- The employees aged 25-34 consider that more people shall be needed as the tasks shall be more complex and the machines require supervision (16%), respectively that the technological development helps youngsters in particular (13%).
- The higher-educated employees opine that the technological progress contributes to the production of more advanced products and services (46%), that the people shall have to learn building new things whereas the robots shall take over the current human activities (25%), and that more employees shall be needed because the tasks shall be more complex and the machines must be supervised (13%).
- The women are more inclined to think that the technology benefits refer to the replacement of harder work (41%) or of more dangerous work (36%).

Except for the specialised training, no consensus exists between the two analysed industries with regard to how the labour conditions shall look in the future.

Most of the Automotive industry employees expect less manual work (83%), better training of the employees (79%), respectively more specialised instruction (70%). There is a wide polarisation in the Automotive industry as regards other aspects:

- the worker occupancy rate: 53% of the employees in the participating automotive industry companies consider that the occupancy shall grow, the workers shall be busier. 47% think that the workers shall be less busy.
- the supervision / control level at work: 52% of the employees consider that it shall grow, while 48% thin that the workers shall be less supervised / controlled at work.
- the work-related stress level: 56% expect that the workers shall be less stressed, whereas 44% think that the people shall become more stressed by their work.

As regards the Oil and Gas industry, most of the employees expect the following changes:

- Positive aspects: less manual labour (90%), increase in the employees' level of training (90%), more specialised instruction (74%).
- Less positive aspects: increased supervision / control at work (82%), increase in the worker occupancy rate (69%), increased work-related stress (62%).

There is a wide polarisation of the results within the various demographic segments no matter the field of activity:

- manual labour: the women and the medium-educated employees consider, to a larger extent, that the future shall come with more manual labour, whereas the men, the higher-educated employees and the employees aged 55-64 think the contrary;
- level of instruction: workers aged 55-64 consider that the employees of the future shall have better instruction;
- specialisation of instruction: the low-educated employees consider that a better education shall be in the future, while the higher-educated employees and those aged 55-64 favour the specialised instruction;
- occupancy: the medium-educated employees opine that the workers shall be busier in the future - unlike the higher-educated employees;
- level of supervision / control at work: the workers aged 55-64 think that the employees of the future shall be less supervised or controlled.

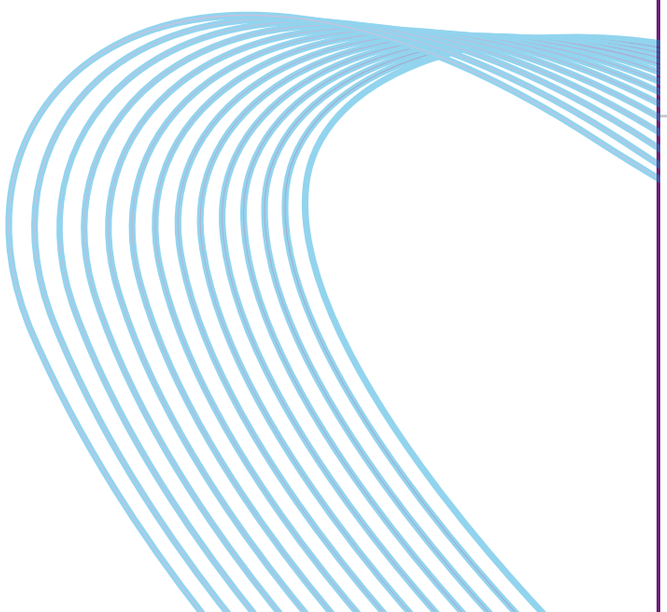


Table 20: Expectations with regard to the future of labour and to the employee of the future

In your opinion, how shall the future labour and, respectively, worker/employee look? Select one single answer for each pair .			
Automotive	**Oil and Gas**	**Automotive**	**Oil and Gas**
More manual labour		**Less manual labour**	
17%	10%	83%	90%
Better trained workers		**Less trained workers**	
79%	90%	21%	10%
Broader instruction		**More specialised instruction**	
30%	27%	70%	74%
Busier workers		**Less busy workers**	
53%	69%	47%	31%
People more stressed by their work		**People less stressed by their work**	
44%	62%	56%	38%
More supervised/controlled employees at work		**Less supervised/controlled employees at work**	
52%	82%	48%	18%

Source: the perspective of the employees in the Automotive and Oil and Gas sectors. The highlighted areas show major differences between the industries (95% confidence level). Automotive (N=1596) / Oil and Gas (N=117)

3.5. Actions required to support the transition to the future jobs

In Romania, although the quantitative impact of technology is still difficult to be measured by the interviewed companies, they are aware of the technology impact on the workforce and, as part of the already learned lessons,they try to identify measures to facilitate the transition.

"Besides making the employees aware of it, I would mention the preparation of efficient plans to implement the technology and to train and reskill the personnel who must use technologies. Some personnel categories must be offered plans aimed at supporting and maintaining them in those activities that do not require a highly performant technology. A balance should be found in using the workforce in all activities."

Source: executive in the Oil & Gas sector company, operational perspective

The clear defining of the vision for the future is identified as a crucial action in facilitating the transition.

Some of the essential strategies identified in training the workforce for the future of labour start from the clear defining of the vision for the future, both with regard to attaining the business targets and with regard to how the workforce should be in order to fulfil the strategic objectives. Starting from this projection in the future, workforce transition and training plans can be implemented, which should be adapted to specific requirements.

The interviewed executives in the Automotive and Oil and Gas sectors also underscore the need for coherence, for sectoral strategies developed by the decision-makers, for aligning the educational system with the business environment requirements and for cooperating with all social partners in order to ensure the transition to the future jobs.

The skill training and development are measures already implemented by companies, which are further identified as significant measures in ensuring a sustainable training for the future jobs.

Here are some of the measures mentioned by the interviewed executives: continuous training of the workforce, specific training whenever new technology is acquired, reskilling for other jobs in the company whenever opportunities are identified, digital or communication skill development programmes. However, nowadays such programmes are largely correlated with the acquisition of new technologies and the proactive educational initiatives organised in advance and those aimed at familirising the employees with the future technology are still isolated.

The direct job supervisors also confirm the importance of developing the working skills with the new technologies (applications or equipment), the specialised technical skills, thesoft skills (labour organisation and structuring, information organisation and prioritisation, communication, relationships and team work, decision-making, autonomy in learning, problem solving, critical thinking, creativity and innovation, team motivation and development), the skills aimed at adjusting to change - such as the change management skills, as well as at improving linguistic skills (of the English language in particular).

Here are some other measures adopted by the personnel training and coaching companies, as per the interviews held with the company executives: **rotation programmes, traineeships, swaps of experience** with other entities in the group which have already implemented those technologies.

Furthermore, the direct supervisors consider as useful other measures as well, such as: **bringing to the team new members who were already trained in the new skills and who can encourage and assist the team members** in developing, encouraging and assisting the team to take part in various modernisation programmes and in the new technology implementation initiatives.

The dual education is highly relevant in the automation and digitalisation speeding-up process

The continuation of the dual education partnership is also identified as an indispensable measure as the new set of skills required by the new jobs becomes more important, because it ensures new pools of young generations of employees who are prepared before employment and who can adapt easier to the technology. However, there still is the challenge of developing their digital and technical skills as the educational system offer is not yet correlated enough with the companies' needs.

Reskilling, professional reconversion and redistribution were identified as measures able to facilitate the transition

According to companies' expectations in the short/medium term, part of the jobs becoming dispensable due to the implementation of technology shall be compensated by natural exits (pensions, resignations). Companies undergoing transformations resort to measures such as reskilling and redistribution in order to ensure the employees' protection, on the one hand, and, on the other hand, the capabilities in line with their organisational needs .

Some opportunities to migrate towards other jobs were identified for the Automotive sector employees, among which:

Table 21: Opportunities to migrate within / outside the company, in the Automotive sector

Job family	**Jobs included**	**Migration opportunities within the company**	**Migration opportunities outside the company**
Assembly / Installation	Installation operator, final inspection operator	Predictive maintenance automatist, quality assurance production lines supply	Jobs in the textile production, food, metallic construction, automotive service industry
Quality assurance	Quality inspector / specialist / analyst	Quality auditor, supervision of quality assurance, supplier quality analysis	Quality assurance and control in other industries (textile), in the car component production, in the manufacturing of mechanical measurement and control instruments, metrological verifications
Maintenance	Maintenance specialist, electrician, mechanic fitter, die maker, maintenance operator, automation specialist	Equipment maintenance uautomatist, numerical control operator, design, technologist, metrologist, robot operator (robotician), electrician, installation conductor	Electrician, maintenance automatist, general servicing, equipment service/ repair, numerical control operator, software tester/developer, robot operator, laboratory technician, prototype design and production
Logistics	Machine attendant, logistics operator, computer operator, manual packaging / bagging operator, lift truck attendant, driver, production management technician, production line operator, technical equipment operator	Production / Installation operator, robot operator, manufacture programming, tuning activities, quality assurance, maintenance, cold metal pressman, supply, supplier relationships	Logistics – supply, inventory management, reception operator, car service unit / showrooms, manufacture operator in other industries, quality assurance, retail, customer relationships, driver, constructions operator
Support and administrative operations	Administrative clerk and assistance / secretariat clerk	Quality assurance, laboratory, logistics, acquisitions, communication, human resources, customer relationship	
Car part and body production	Car body metal worker, installation conductor, founder-moulder, bridge crane attendant, welder, cold metal pressman, sandblast cleaner, industrial robot operator, mechanical processing operator	Maintenance automatist, installation working and maintenance operator, industrial robot operator	Car mechanic, car technical inspection mechanic, mechanic fitter, electrician, installation working and maintenance operator, logistics, crane operator, distribution and sales, automated/ robotised machine tool line conductor, constructions, foundries
Dyeing	Dyer	Production / assembly operator, quality assurance and control	Dyer in car service units, car showrooms

Source: Opinions voiced by the direct supervisors of analysed jobs, with regard to the migration opportunities

The main migration opportunities for the Oil and Gas sector jobs under analysis, as identified by the direct supervisors of analysed jobs, include:

Table 22: Migration opportunities within / outside the company, in the Oil and Gas sector

Job family	Included jobs	Migration opportunities within the company	Migration opportunities outside the company
Control and dispatch	Dispatch operator and dispatch shift leader	Support activities, logistics and transport, car fleet monitoring, production operator	Transport companies, car service unit, jobs in the exploitation area in the chemical petrochemical industry, transport or electrical and thermal energy distribution, operation of gas compression or desiccation stations, deposit management
Geology and exploration	Geologist, geological engineer, geophysicist, sedimentologist	Environment protection, preparation of deposit studies and/or drilling projects, digital geological design / modelling	Seismology, specialties in geology (stratigraphy, paleontology, paleobotany, general geology, petrophysics, mineralogy...etc), geodesy - topography, geotechnics, cartography, environment studies, hazard studies, specialty auditor, geologist in exploiting geothermal water or other mineral resources, teachers
ÎProduction servicing and maintenance	System, instruments and automation engineers, corrosion engineers, operators for the treatment and monitoring of production conditions	Maintenance and integrity engineer, inspector, supervision / maintenance, planning, project management, energy managementul	Cathodic protection inspector, operation and process supervisor, electrical and automation equipment design and execution, maintenance and integrity engineer, electrical network and plant designing, installation and maintenance engineer, electrical and automation equipment design and execution
Production optimisation	Programming, optimisation and automation engineers (different from those in the servicing and maintenance area), production supervision and artificial lifting engineers	Production engineer, Operational Hub, project management	Engineering connected with the Oil and Gas industry, collaboration in preparing technical projects, technical documentation, equipment/installations, electrical energy/ gas distribution, constructions, installations, mechanical engineering and technological machinery, electrical and automation equipment design, execution and related services, automation/monitoring system production/integration, teachers of technical subjects in secondary and vocational schools, equipment acquisitions
Production	Gas and petroleum extraction operator	Maintenance operator, specialised operator / tchnician	Gas transportation operator, watchman, stoker
Support and administrative operations	Financial analyst, customer service analyst, administrative specialists, human resources specialist	Activities of customer support/assistance for the activities requiring human interaction, environment protection, health and work security specialist / inspector, internal auditor	Activities of customer support/assistance for the activities requiring human interaction, administrative support, environment protection, health and work security specialist / inspector, internal auditor , jobs in the machine engineering/ industrial construction industry, in industrial equipment maintenance services
Refining optimisation	Programming and process improvement experts and s specialists	Production programming and planning activities	Engineering, designing, acquisitions
Refining	Refining chemist, of different grades	Production Operator, mechanic fitter, senior technologist	Senior technologist, site or board operator, mechanic fitter, driver

Source: Opinions voiced by the direct supervisors of analysed jobs, with regard to the migration opportunities

If there will be affected jobs for which none of the skill improvement, reskilling or redistribution measures is relevant, other measures could be applied for the protection of the affected employees, such as partnerships with the suppliers to which part of the personnel can be redistributed, partnerships with specialised companies which can offer the necessary consultancy and reconversion depending upon the market demands.

The need to adapt the workforce to the new demands and the management of the reluctance to change were identified as some of the companies' concerns as regards the adoption of technology. In this respect, companies emphasise the need for clarity in the statements about the transition to electrification in the automotive sector, for example the clear communication of their key objectives and of the behaviour they expect on behalf of their employees, as well as the need to grow the popularity of the subject.

Certainly, the interviewed companies are in various stages along this path, but the results of the surveys made in the companies show the **need for a greater communication** and for a greater effort on behalf of the proactive change management. The direct supervisors of the analysed jobs proposed some examples of actions to this end, such as: sustained actions whereby to present the advantages of the technologisation, of the technological evolution impact on the existing jobs and of the future opportunities, including the presentation of new, potential jobs together with examples from other, more advanced sectors.

First of all, the employees expect the employers' assistance but they are ready to learn by themselves as well.

From the perspective of the transition to the future of labour, the quantitative analysis emphasised the employees' expectations regarding the legitimate initiators of the necessary assistance for employees, both from a normative (What should employees do?), social (What do you think the employees will do?) and personal What do you think you will do?) point of view.

The three perspectives point in the direction of the assistance offered from the employees' immediate proximity: the employers - through training or protection-against-technology risk programmes, or personal development (learning by themselves). The support on behalf of the state or the trade unions is generally of a smaller importance, according to the employees' opinion.
Normative level - What employees should do faced with the technological development

The interviewed workers consider that the employees in the monitored industries must ask for the assistance of their employers (e.g.: training or protection-against-technology risk programmes) or must start to learn new things by themselves rather than rely on the support of the state or of the trade unions. Searching for another job or the lack of reaction towards technological development are the least desirable options.

The Oil and Gas sector employees think that it is important for them to ask their employers for training programmes in order to cope with the new tasks, while the Automotive sector employees aim more at searching for a new job in the context of the technological development.

The higher-educated employees think it more important to ask their employers for training programmes (2.7 - weighted average) or to learn new things by themselves (3.5).

At the same time, the persons aged 55-64 aim more at the employer's support - either by requiring training programmes (2.7 - weighted average), or by protection against the risks brought by technology (3.2).

Table 23: Results answers "What should the employees do in front of the technological development?" – normative level

What should the employees do in front of the technological development	Automotive *Weighted averages**	Oil and Gas *Weighted averages**
To ask the employers for training programmes in order to cope with the new duties	3.1	2.4
To ask the employer for protection against the risks brought by technology	3.5	3.1
To start learning new things by themselves	3.9	3.6
To ask the Romanian state to protect the employees against the risks for their jobs brought by technology	4.5	4.8
To ask for counseling on behalf of the trade unions	4.7	4.6
To wait for the Romanian state institutions to organise training / coaching / reskilling programmes	5.0	5.3
To look for another job, in line with their qualification	5.5	6.5
Nothing for the time being, to wait and see what will happen	5.9	5.8

Source: the perspective of the employees in the Automotive (N=1596) and Oil and Gas (N=117) sectors
**'1' = the most important, '8' = the least important. The highlighted areas show major differences between the industries. General perspective - What will the employees do when faced with the technological development*

Confronted with the technological advance, the employees in the two sectors mentioned that they expected the workers to ask for the employers' support - for training or protection-against-technology risk programmes - or to begin to train by themselves rather than asking for the state's assistance or the trade unions' counselling. The changing of the job or the lack of concrete reaction are among the least important actions in this context.

The workers in the Oil and Gas area consider to a larger extent that it is important for the employees to start learning new things by themselves, whereas the Automotive industry employees concentrate to a larger extent both on the training programmes on behalf of the Romanian state, and on the searching for a new job.

The higher-educated employees think it is more important for the employees to ask their employers for training programmes (2.9 - weighted average) or to start learning new things by themselves (3.8).
The persons aged 55-64 consider to a larger extent that the workers shall ask their employers for training programmes (2.6 - weighted average).

Table 24: Results answers "What will the employees do in front of the technological development?" – general level

What will the employees do in front of the technological development	Automotive *Weighted averages**	Petrol şi Gaze *Weighted averages**
They will ask their employers for training programmes in order to cope with the new duties	3.2	2.7
They will ask the employer for protection against the risks brought by technology	3.5	3.1
They will start learning new things by themselves	4.2	3.5
They will ask for counseling on behalf of the trade unions	4.6	4.3
They will ask the Romanian state to protect them against the risks brought by technology	4.6	5.1
They will wait for the Romanian state institutions to organise training programmes	4.8	5.5
They will look for another job, in line with their qualification	5.5	6.2
Nothing for the time being, they will wait to see what will happen	5.6	5.7

Source: the perspective of the employees in the Automotive (N=1596) and Oil and Gas (N=117) sectors
'1' = the most important, '8' = the least important. The highlighted areas show major differences between the industries. Individual perspective - What will the employees do at personal level when faced with the technological development

At personal level, the workers in the monitored industries state that they will protect themselves against the technological advance either resorting to their current employer – asking for training or protection-against-technology risk programmes – or by themselves, starting to learn new things. The support of the state or of the trade unions are less important in the employees' choices.

If we compare the monitored industries, the change of the workplace or the lack of a concrete reaction represent more important options for the Automotive sector employees, while the training by themselves is more important for the Oil and Gas industry workers.

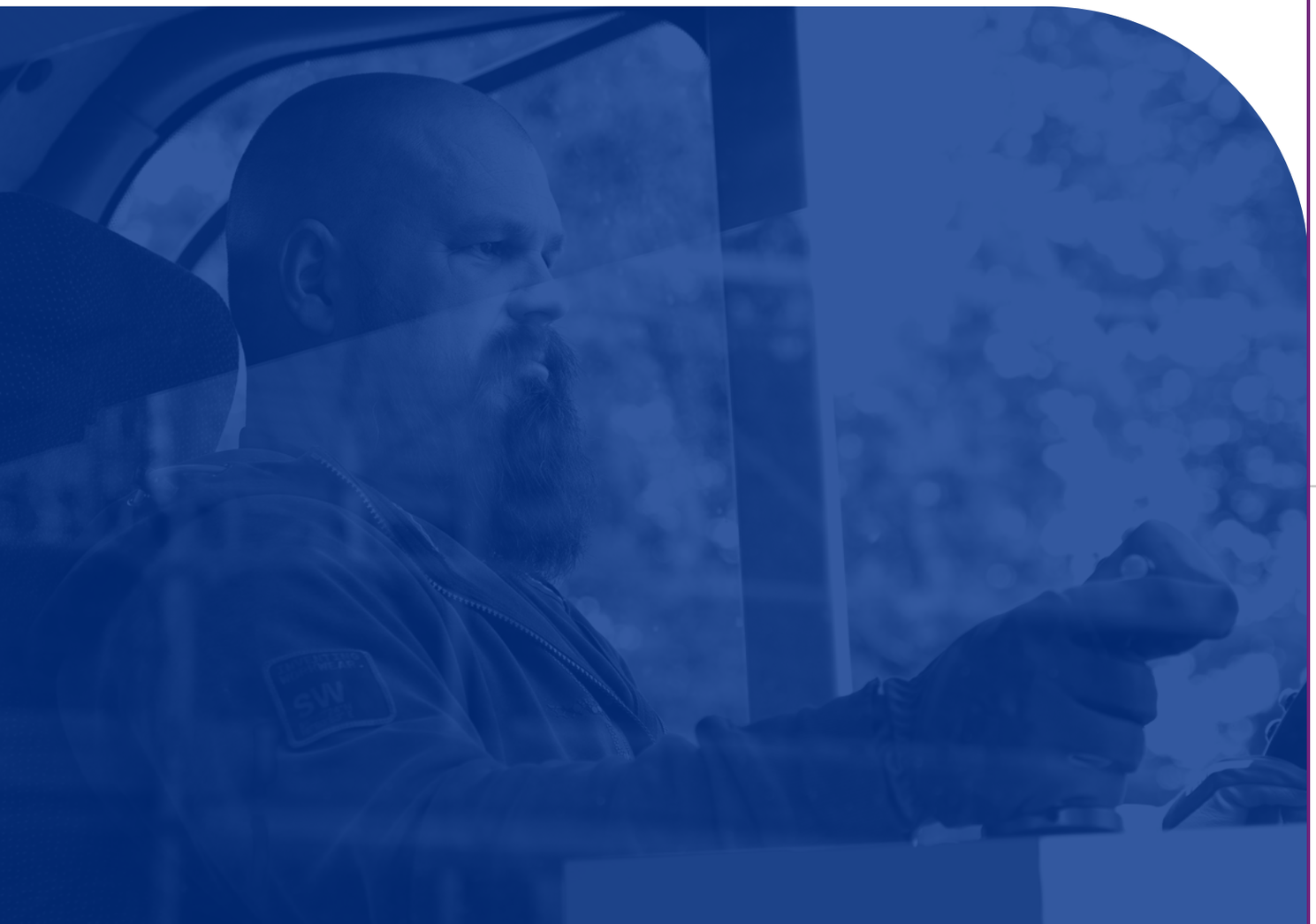
The higher-educated employees think it is more important to ask their employer to organise training programmes (2.9 - weighted average, to start learning new things by themselves (3.2 or to ask the employer's protection against the risks brought by technology (3.5.

The workers aged 55-64 consider to a larger extent that it is important to ask their employer for training programmes in order to cope with the new duties (2.7 - weighted average).

Table 25: Results answers "What will the employees do in front of the technological development?" – individual level

What will the employees do at personal level in front of the technological development	*Weighted averages**	Oil and Gas *Weighted averages**
I shall ask their employers for training programmes in order to cope with the new duties	3.2	2.6
I shall ask the employer for protection against the risks brought by technology	3.6	3.7
I shall start learning new things by myself	3.7	2.9
I shall ask for counseling on behalf of the trade unions	4.7	4.1
I shall wait for the Romanian state institutions to organise training programmes	4.7	4.9
I shall ask the Romanian state to protect me against the risks brought by technology	4.8	4.8
Îl shall look for another job, in line with my qualification	5.5	6.4
Nothing for the time being, I shall wait to see what will happen	5.7	6.6

Source: the perspective of the employees in the Automotive (N=1596) and Oil and Gas (N=117) sectors
**'1' = the most important, '8' = the least important. The highlighted areas show major differences between the industries.*



4. Conclusions

The adoption of technology in the analysed industries is growing

The adoption of technology is a consequence of the environment in which companies operate. The aging of the population, climate changes, consumer's behaviour, new ways of working, regulatory framework, globalisation, geopolitical context are elements influencing the two industries and their increasing appetite for process digitalisation and automation.

In the **automotive industry**, which is already advanced with regard to technology adoption, the executives of the interviewed companies expect that the digitalisation and automation shall enhance. The opinions on the anticipated rate of adoption differ, some anticipating its acceleration in the future, mainly in the context of the transition to hybrid and electrical engines, whereas others opine for a less steeping curve, in the short term at least, as the automotive industry is still in a difficult period because of the pandemic, the electronic component crisis, the raw material price increase and the deficit of properly skilled personnel.

The opinions in the **Oil & Gas** sector, too, refer to such acceleration, the adoption rate being debated from a moderate acceleration in the medium term gradually to a more rapid acceleration caused by the external factors and the market changes.

However, it is **certain** that a consensus exists as regards the expansion of digitalisation and technologisation in the two sectors over the next years.

The companies are concerned over the digital transformations but the workforce projections for the future are still limited.

Digital transformation and technologisation are important issues on the interviewed companies' agenda and there are are articulate strategies and plans. The interviews revealed, however, the need to further anticipate how the workforce should be in the future as well as to define strategic plans with regard to the workforce.

The companies estimate that technology shall influence the workforce structure mainly at a qualitative level

Companies foresee changes in the workforce structure, however - although a descending trend is anticipated because of some cost optimisation opportunities based on technology -, in the short-medium term the companies do not anticipate significant job reductions.

Instead, both in the long and in the short-medium term the qualitative changes shall prove important as the companies will need new sets of skills and the skill level will further increase. This trend underscores that sound skill training and developing plans are needed and the efforts aimed at endowing the workforce with the necessary skills shall reach an unparalleled level. As regards the employees' reskilling and redistribution from the jobs potentially eliminated by technology, the opportunities shall depend on the employees' training and specialising level and on the roles available in the company, whereas some employees will have to be reskilled for

other jobs outside the company.

In the long term, taking into consideration the uncertainty about the pace and way in which the transition will take place, the impact on the occupancy is also very difficult to anticipate, which was revealed by the interviews held with the companies participating in this study.

The transversal and soft skills grow in importance alongside the digital skills

The digital skills, those in the **STEM** (SCIENCE, TECHNOLOGY, ENGINEERING AND MATH area, such as the development of the skills aimed at managing and using large volumes of data, processing various signals, extracting and using estimates and prognoses, using possible automation processes, shall further grow in importance.

Furthermore, the transversal skills become more and more important, as they help us to differentiate from the technology, and they shall become necessary in every job, such as mental flexibility, creativity, problem solving, decision analysis and decision making, alongside some soft or social skills, which are more difficult to be automated, such as the skill to relate to others, to adapt to the others' needs, to work in a team, as well as communication, persuasion, negotiation and emotional intelligence.

By developing a new set of skills of the future, the employees will have the flexibility to perform activities that complement automation, which will differentiate them from the technology, with a potential significant impact on the employees' work satisfaction and motivation, by a differentiated contribution, in particular in those areas where the technology has not arrived yet.

Some skills associated with manual, repetitive tasks reduce their importance

The skills estimated by the study as decreasing in importance in both sectors due to the technological evolution are those related to the manual skills and to the data collection, management, handling, processing and reporting, or those involved in the repetitive activities.

Furthermore, the comparative analysis of the opinions voiced by the employees in the two sectors reveals that, in their view, there are certain skills whose importance will diminish in the future, such as Operation monitoring and Performance monitoring

As the companies adopt more technology, the jobs will go through a transition and a new digital workforce class will develop

Opinions differ with regard to the impact digitalisation and automation shall have on jobs. Certain operations carried out by the human workforce shall be taken over by robots or by the so-called digital workforce, whereas others shall continue to be carried out by humans, in parallel with the development of new tasks and activities involving the use, handling and improvement of such technologies, be them software applications or equipment.

But as each change involves an opportunity, this scenario, too, is based on some **potentially positive results**. Cognitive technologies can cause the increase in the number of jobs, which shall make best use of the human skills, such as social and relationship skills, and which can facilitate the development of new skills and expertise. Thus, they can change each employee into an innovator and can transform the company into an innovating engine.

The provision of a skilled workforce remains a challenge for companies

In order to continue their digitalisation plans, the companies also need a competent workforce prepared for a new way of working .

ÎAs regards the training and reskilling of the existing personnel, the executives say they have launched measures aimed at assisting the employees affected by the job transformation, but their implementation pace differ depending on the employees' profile and appetite for change. Companies have both employees who have rapidly adhered to technology and are eager to learn new things, and employees who are not interested in the development of new skills, in which case the companies need a sustained plan to encourage the transition. Moreover, reference was made to the difficulties in retaining the already trained personnel because of the high competition for the new skills.

The *war of the talents* shaped according to the new way of working and to the digital skills is making itself felt also in the personnel attraction and recruitment from outside sources, the analysed companies saying that they have begun to compete for talents with other industries

The employees are familiar with the world trends and with the importance of technology for their sectors, but they are not aware of its impact on jobs

Most of the employees are more familiar with those new notions which have an immediate impact on their personal lives and which are more visible in mass media.

However, as regards the notions closely connected with the technological evolution in their field of activity, the notoriety is much lower, and a dedicated dialogue between companies and employees is probably necessary aimed at informing and training the employees on how to actually use them in their jobs .

The employees in the two sectors are open to technology provided that they receive assistance and training on behalf of the employers

The great majority of the employees in both industries are aware of the technological progress benefits in their activity. In their opinion, among the main benefits of the rapid technological development are: the productivity improvement, the reduction of the physical, the reduction of the operating time, the taking over of harder or more dangerous works, as well as the contribution to the creation of more technologically advanced products and services.

Faced with the technological development, the employees in the two analysed sectors will ask for their employers' support in organising training programmes or they will start learning by themselves rather than asking for the state's or trade unions' support. The job change or the lack of a concrete reaction are among the least important actions in this context.

Although the employees in both industries opine that the areas they are working in are still relevant, the answers given by the two groups of employees differ in many aspects, as followsl:

- The workers in the Automotive industry consider technology as being important, but they are concerned both with the supply chain problems and with the

relevance of the products in the current portfolio and with the decreasing demand for the current products, most likely in the context of electrical, hybrid or even autonomous cars;

- For the Oil and Gas employees, on the other hand, technology is much more important, the supply change problems are considered less significant, it is necessary to diversify the product portfolio and to increase the human resources working in the field. Unlike the Automotive industry employees, only a marginal share of the Oil and Gas industry workers consider that heir industry is facing a decline in the market demand.

According to the employees' opinion, some technical or basic skills decrease in importance, this being the case of those job families that are connected with logistics, servicing and maintenance or quality assurance activities.
In the Oil and Gas industry the employees think that the main skills decreasing in importance are those associated with the human interaction and quality control, more relevant for job families – support and logistics.

5. Recommendations

Transformation of the strategic workforce planning process towards agile processes, based on foresight and scenario planning

One of the challenges facing the companies in the context of the rapid and disruptive change is the strategic workforce planning in a VUCA world in which volatility, uncertainty, complexity and ambiguity make the projections for the future quite difficult, in particular in the long term.

The traditional workforce planning can no longer offer answers in a world in which success depends on the new technologies. Companies will have to recruit, develop and retain the talent and the appropriate skills, also understanding how the workforce size and structure will have to change in line with the technology. In this context, instruments and methodologies such foresight or the exploration of how the future may look like in the short, medium and long term, alongside the scenario-based agile workforce planning can assist companies in better preparing for the future.

The digitalisation strategies must be accompanied by human resources management strategies deep-rooted in agile workforce planning processes. Certainly, in a permanently changing world, it is important that several scenarios be taken into consideration in designing the vision for the future in order to support agility and flexibility.

The challenge will be how to best restructure the workforce and how to organise the roles so as to successfully integrate the human workforce with the digital one.

Identification of critical skills and development of the future skills

The study demonstrates that the training, the skill development and the workforce reskilling are significant priorities of all companies, both in the context of the current skill deficit and from the perspective of the coming transformations due to technology expansion. But the skill development should take into consideration the vision for the future, the new operating processes and patterns available to companies, besides the management of the particular training needs determined by the current investments in technology. The workforce training for the future is a long process, and this process must take into consideration both the current operating needs and the workforce transformation and training for the future. And this approach begins with another difficult question: What critical skills do we need for the future and how do we start developing them?

Consolidation of transversal skills

An essential measure aimed at reducing the employees' vulnerability against workforce structural changes is the growth of adaptability and their training with the transversal skills

whose importance grows in the future, as well as the communication, critical thinking and analysis, problem solving, personal development skills (active learning) and the so-called adapting skills (resilience, stress tolerance and flexibility). Such skills can help them, on the one hand, to adapt to new technology-assisted working processes, which is a critical element in the companies facing digital transformations, and, on the other hand, to grow their mobility potential if their roles are affected, both within and outside the company, between economic sectors.

Development of digital skills

In a digital economy, the digital skills become key skills for the entire population. As Romania registers some of the poorest results in this area at the EU level, sustained measures and investments are necessary in order to develop digital skills, from comprehensive programmes in schools or in companies, or digital alphabetisation programmes, including in the areas inhabited by population at risk of social exclusion.

Development of continuous training systems in order to support a lifetime continuous learning approach

The technological change leads to an increased need of trained workforce and of medium or high skills, also at the level of the jobs which required a low level in the past. Moreover, in the context of the frequently disruptive changes that are expected to take place on the labour markets in the next years, the employees need access to training during their entire life in order to get more skills, either transversal or specialised, and to be able to meet the changing skill requirements.

The development of continuous training and life-long learning systems requires the cooperation among all the labour market actors, decision-makers and social partners.

Here are some examples of such initiatives[32]:

- Italy passed a law whereby the adult educational system was reorganised. The former evening centres and courses were included within the new Centres for Adult Education (CPIA), offering personalised learning means in order to improve adults' skills and aptitudes.
- In Austria, a National Life-long Learning Strategy (LLL: 2020) was introduced still in 2011, with the aim of helping old employees to maintain their basic skills, growing the old people's access to education and training and promoting the learning-oriented working environments. Its objective is to set a nationwide education and training services offer for the old people in their local communities .
- The Targeted Initiative for Older Workers (TIOW) of Canada is a specific example of older population training initiative. Canada's government offered additional funds in line with the Economic Action Plan supporting older workers to participate in workforce occupancy activities , such as the learning of evaluation methods and the development of skills so that they can find jobs.

[32] Concordia Employers' Confederation, Quantitative and qualitative analysis of the labour market in Romania, 2019 and OECD, Let's create lasting jobs

Correlating school-acquired skills with the Romanian economic realities

As regards the future employees, the educational system does not adequately prepare the youngsters for the labour market. There still is a strong emphasis on the academic approach and too little on the vocational training, although some steps were taken towards this end by means of the dual education .

There is a need for a strategic approach of the educational process, which should allow the correlation of school-acquired skills with the Romanian economic realities, in line with the evolution of the labour market demands. If we think that many of the jobs of the future have not been invented yet, the need is even more stringent. A crucial step is to adapt the pre-university curriculum and the university programmers to the current and medium- and long-term predictable needs, also taking into account the skills needed by the future workers in order to become employable

Such an action requires an intensified dialogue between the employers and the authorities in charge with the curriculum development so as to rethink and train in schools those types of skills which the future workers need in order to be employable. New programmes have to be thought for adults, most of the current ones being designed for a standard educational course.

Development of open-to-change organisational cultures

In a digital world the organisations need constructive organisational cultures, which encourage innovation, flexibility, growing mentality, cooperation and which tolerate rapid changes. The study reveals that one of the companies' challenges is the adaption of the workforce to change, and such an action should begin with the cultural investigation – and, if necessary, transformation, in order to ensure a sound transition towards a future in which the people work alongside the technology.

The objective is to create a working environment in which roles can evolve, people can access new career paths, with a continuous learning-oriented mentality and open to change, where everybody is in charge of inovation and experimentation .

Growth of the employees' familiarity with the anticipated changes

The companies' role in familiarising the employees with subjects such as the technological advance and how labour could change in the future is crucial, and a first undoubtedly difficult step is the beginning of a sincere dialogue with the employees regarding the impact of technology on the continuously changing industry, company and skills

Companies are expected to acknowledge the necessary magnitude of change and to propose concrete measures whereby to adjust the employees' skills to this change. Moreover, the employees must be actively interested in maintaining their relevance in the new labour era

Cooperation between the public and private systems with the aim of training the employees for the digital economy

The labour market is already in a fragile balance as companies are facing a workforce deficit. We need long-term development strategies at sectoral level, which should take into consideration both the technological and the demographic, environmental, political and social evolutions with impact on the society development

In a digital economy the employees will need new skills, and the effort to develop them is huge. The training and reskilling options are, for the time being, limited. The creation of jobs and the employees' training so as to be able to compete for them require the large-scale mobilisation of all involved participants: authorities, companies, social partners. And this cannot happen without the planning and the cooperation between the public and private sectors

The World Economic Forum[33] draws attention to the crucial role played by governments in ensuring an efficient transition towards the future of labour. They can strengthen the link between skills, salaries and workforce occupancy, through sound public. We need policies and programmes to support the reskilling and training programmes, whereby the employees can get the skills necessary in a future job, in particular when we refer to the employees in the middle or at the end of their career.

Furthermore, the cooperation between the industry participants is important. The training and reskilling efforts shall not have their expected effect if they are isolated, solutions are needed at the level of the sector .

Strategically, all these pressures aimed at rapidly updating the employees'' skills and at re-technologizing company production units pose a great challenge: **what will Romania's role be in the global production chain**, in the broader context defined by: (1) increased investments in technology, which will result in the potential aligning of the outsourcing prices in Romania to the international production prices, in particular in the Automotive; (2) the change of the energy transport and distribution corridors following the Ukraine war; (3) the returning to the question of using, at least in the short term, of fossil fuels because of the previously mentioned conflict; (4) great energy price increases and higher vulnerability of the global demand, and (5) the restructuring of the supply chains for certain key components (e.g.: semiconductors for the automotive industry)?

Probably a zero-based type thinking is needed, where the governments, the educational systems, the companies and the employees should critically analyse the current context, be aware of, and sincerely communicate about, the impact of some necessary changes which can be beneficial if properly implemented.

As more robots and other technologies enter the companies, the executives face the challenge of integrating the digital workforce with the human workforce. This dynamics gives birth to some difficult questions which the company, government, social partner executives and the employees have to address pro-actively:

Organisations:

- How will our operating pattern develop so as to remain relevant and competitive ?
- How will our workforce look like in the future ?
- How do we successfully integrate the digital workforce with the human workforce ?
- How do we retain the employees and how do we support their motivation and commitment in a world where the job security is seen as being threatened by technology?

[33] World Economic Forum, The Future of Jobs Report 2020, 2020

- How can we make best use of the new economic opportunities, also ensuring the employees' welfare ?
- What is the automation impact on the consumer's experience and how can we make sure that it will be prioritised?

Organisations and social partners:

- How do we train the employees for the future ?
- How do we plan and predict in a VUCA world, in which volatility, uncertainty, complexity and ambiguity are part of the game rules ?
- How do we integrate 3 generations in the same workplace ?

Social partners and governments:

- How do we educate the future workers ?
- How do we permanently ensure the employees a set of skills able to maintain their relevance on the labour market ?
- What do we do with those whose jobs were displaced ?
- How do we attract employees to continue learning during their entire life ?

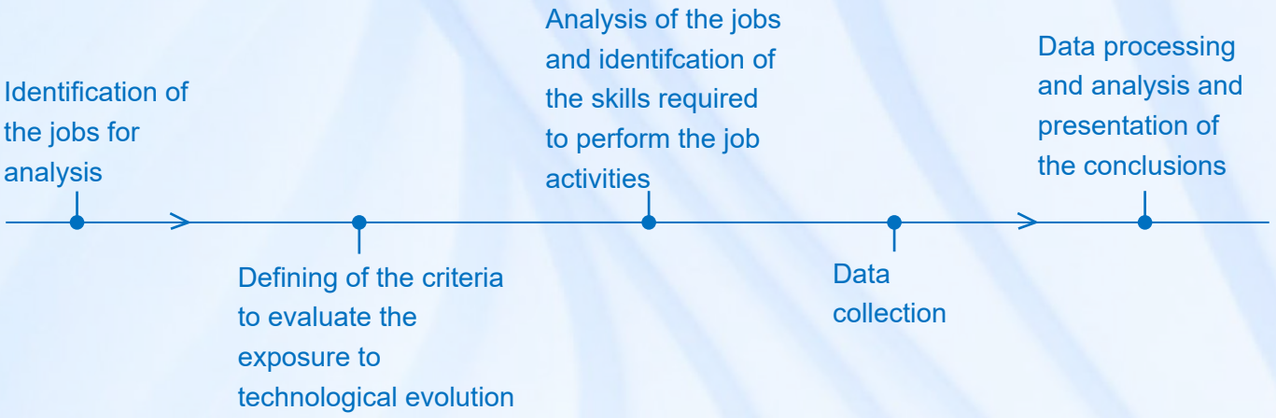
Employees:

- How do we make sure that we remain relevant ?
- How do we prepare for the future?

6. Methodology and sampling

The study organised by the Concordia Employers' Confederation and carried out together with KPMG Advisory and IPSOS was attended by 4 companies in the Automotive and Oil and Gas industries, two from each sector, totalling more than 30,000 employees.

In making this study we structured our activity on 5 steps:



1. Identification of the jobs for analysis:

At the beginning of the study the participating companies were invited to identify a number of approx.. 30 jobs for each sector, potentially exposed to technology, which formed the basis of the analyses. The participating companies identified a number of 96 jobs based on a set of criteria sent by the Project Team. The final analysis and reporting included 89 distinct jobs, because there was a (limited) series of similar jobs in the companies, for which a unitary reporting was. These jobs were grouped by job families, relevant for each industry.

The job families falling in the 53 analysed jobs in the Automotive Sector are: Assembly / Installation, Quality Assurance, Maintenance, Logistics, Support and administrative operations, Car part and body production, Dyeing.

The job families including the 36 analysed jobs in the Oil and Gas Sector are: Control and dispatch, Geology and exploration, Production servicing and maintenance, Support and administrative operations, Production optimisation, Refining optimisation, Production and Refining.

Annex 2 includes the full list of the analysed jobs.

2. The defining of the criteria for the evaluation of the exposure to technological evolution:

Five criteria, with equal share, were identified and taken into consideration in determining the exposure of the jobs to automation and digitalisation. According to the market studies and researches, the high presence of the 5 criteria in fulfilling the job duties is associated with a high exposure to automation and/or digitalisation of the duty, respectively of the jobs.

Criterion	Criterion description
Repetitivity, monotony, predictability	The level at which the activity implies repetitive operations performed according to clear instructions, with simple, standard steps with very few changes
Physical shape	The level at which actions require fine motricity, dexterity, body mobility, visual acuity for carrying out the activity
Risk level	The level at which the performed actions are difficult and associated with a high risk
Information handling	The level of clarity and defining of the handled / processed information
Technological evolution	The level at which the current technological developments can lead to the activity digitalisation / automation
Organisational benefits	The level at which automation shall bring benefits to the organisation (efficiency, quality, cost, consistency, business continuity, consumer satisfaction)

3. Job analysis and identification of the skills required to perform the activity on the job:

The Team Project analysed in detail the job lists and proposed an inventory including between 37-40 skills, differentiated by each industry, based on the O*NET skill catalogue. The identified skills were grouped in 5 categories

- basic skills,
- cognitive skills,
- social skills,
- management skills and
- technical and system skills .

4. Data collection

included 2 stages, the qualitative stage and the quantitative stage.

The data collection ***qualitative stage*** was performed by three methods:

- Research based on the data from public sources, studies and specialty literature regarding the general perspectives on the digitalisation and automation impact on jobs;
- Examination of company representatives' perspective with regard to the automation and digitalisation impact on the workforce, by running 19 interviews with decision makers in IT, HR and Business / Operations in each industry, further called decision-makers or executives;
- Examination of the direct job supervisors' perspective on the job exposure and

the skill importance dynamics in the context of the technological evolution, as well as on the opportunities to migrate to other jobs within or outside the company and the actions necessary for transition.

The analysis of the supervisors' opinion was made based on an on-line questionnaire. A total number of 159 answers on behalf of the supervisors were collected.

The exposure level was obtained from the supervisors' evaluation of the exposure criteria concerning the most important 5-7 skills of the analysed jobs, according to the following scale: Irrelevant (0% – 30%), To a small extent (31%-50%), To a certain extent (51%-70%), To a great extent (>70%).

The skill importance dynamics was obtained from the supervisors' evaluation of the skill importance in fulfilling the analysed job duties, both in the present and in the future, using the scale:
Irrelevant (0% – 30%), To a small extent (31%-50%), To a certain extent (51%-70%), To a great extent (>70%).

The **quantitative stage** of the data collection involved the interviewing of 1,713 respondents in the two industries under analysis. The number of interviews resulted from the following factors:

- the number of participating companies;
- the total number of employees in each company;
- the number of employees for each of the selected jobs considered as potentially exposed from a technological point of view to the changes brought by digitalisation in each of the two industries;

The answer rate for each job

The filling of each questionnaire lasted 10-15 minutes, and the questionnaire included only closed questions. Most of the questionnaires were filled on-line, sent to the participating companies. A small share of the total number of questionnaires (4%), respectively 55% of the questionnaires filled by the Oil and Gas industry employees were filled on paper.

5. Data processing and analysis and presentation of conclusions:

After the consolidation of all the information obtained in the data collection stages (research of the market studies, interviews with company executives, exploration of the perspectives expressed by the direct supervisors and by the employees), the data analysis and interpretation stage began as well as the generation of conclusions and recommendations regarding the technology impact on the two analysed sectors, on the job and skill dynamics in the context of the technological evolution, as well as on the opportunities to migrate to other jobs and the necessary actions to support the transition towards the jobs of the future.

The analysis and processing of the data obtained after collecting the direct supervisors' perceptions used the following approach:

- The exposure to the technological evolution represents the extent to which a duty, a job or a job family will be affected by technological developments, considering the previously mentioned evaluation criteria. The exposure level was generated as a percentage, as the average of the values obtained from the supervisors' evaluation of the exposure criteria, resulting the following exposure levels: limited exposure level (<30%), medium exposure level (30%-50%),

high exposure level (51%-70%), significant exposure level (>70%).

- The duty exposure was calculated as an average of the values obtained for each exposure criterion;
- The job exposure was calculated as an average of the exposures by each duty;
- The job family exposure is represented by the interval between the lowest and the highest exposure level of the jobs making up that job family.

- The increase in importance of the skills in the technological evolution context was obtained based on the supervisors' perception, by calculating the percentage increase in the number of supervisors having appreciated that ability is important to a great extent in the future than in the present. The decrease in importance of the skills was obtained by calculating the percentage decrease of the number of supervisors having appreciated that ability is important to a great extent / to a certain extent in the future than in the present .

The following approach was used in processing the data obtained from the collection of the employees' perception and the analysis of the exposure to the technological evolution :

Step 1

As not all the jobs within each participating company benefitted from a minimum number of 30 interviews, the analysis was made at the level of the job families in each industry;

Step 2

In order to obtain the exposure level, analysis was made of the answers to the "less important" option of the questions regarding the skills in the questionnaire for the job supervisors.

"Now, please look at this list of skills required by your current job. Select what you think of a skill : it will be more important or less important for your job in the future if technology develops. There should be only one answer for each skill."

In order to identify the skills which will be exposed in the future, the share of each skill at the job family level was compared to the average of the analysed industry, making use of a mathematic calculation called indexation (reporting the share of the skills exposed at the job family level to the share of the skills exposed per total industry).

This comparative calculation helped to emphasise the skills which have a major exposure within some job families. We took into consideration the skills for which the exposure within a certain job family exceeded by at least 20% the exposure at the industry. In the Oil and Gas industry, because of the reduced number of interviews at the level of several job families, there were some exceptions where the exposed skills were selected based on indices that were only 14-17% higher than the average of the exposure at the analysed industry level.

Step 3

Starting from the exposed skills (less important), they were compared to the list of relevant skills for the current jobs in each industry, thus keeping only those skills which are both **exposed** and **relevant** .

Step 4

Making use of the same principles, we investigated the relevant skills which will become more important in the future, starting from the answers to the “more important” option to the questions on the importance of skills for the future of jobs.

Step 5

The detailed list of the relevant skills, which are also exposed, respectively more important, allowed us to carry out detailed analyses:

- Graphical illustration of the impact of the exposed skills to the job families
- Analysis of the exposed job families from the perspective of the decrease in the skill importance
- Analysis of the exposed jobs families from the perspective of the decrease in the skill importance
- Analysis of the skills estimated to increase in importance by the employees of each industry

7. Assumptions and limitations

Assumptions

The study took into consideration some working assumptions, namely :

- Digitalisation accelerated the pace of the technological changes within the two analysed industries.
- Companies are open to actively participate in this action which helps them understand better the impact of these changes on the companies in the two industries.
- The qualitative and quantitative analysis will offer actionable directions with regard to necessary actions in order to use the impetus of the technological (r)evolution in continuously training the human resources.

Limitations

In the qualitative analysis, the exploration of the direct supervisors' perspective was based on their filling some questionnaires sent on-line, with the aim of collecting information for the analysis of jobs and of exploring their trends and perceptions regarding the impact of technology on the jobs, but without running a quantitative research at the level of this group.

The exposure of the duties or the skills to technology, evaluated based on the abovementioned methodology, reveals duties which could be automated, that is jobs more exposed to automation or digitalisation. This does not necessarily means that those duties will be automated and the jobs will be replaced by technology, they being rather dependent on the economic context, the political environment, the business strategies and on a variety of practical aspects, decisions and constraints.

In the quantitative research, the final number of respondents for each of the analysed jobs did not reach the minimum threshold of 30, because there is no overlapping between the jobs considered as exposed to the technology as regards the job title, the required skills and the number of occupants of each job, and the actual number of the occupants of the jobs selected by the participating companies is below this threshold.

Essentially, the quantitative study measured the employees' perceptions and attitudes regarding the impact of the technological development on their professional. It is not a neutral and objective measurement in quantifying this impact.

The Skillscape® methodology is owned by MIT, this is why the quantitative analysis of the correspondence between the technology-exposed jobs and the importance of the skills characteristic for those jobs was made by making use of the principles of this methodology.

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9. Annex 1 – Comparative image of the skill importance dynamics in the context of the technological evolution

We give below a comparative image of the dynamics of the skills analysed in this study with regard to the growth or the decrease of the skill importance in the context of the technological evolution, from the perspective of the direct supervisors of analysed jobs, of the employees as well as from the global researches and studies.

The Automotive Sector

Table 26: Comparative image of the skill importance dynamics, in the context of the technological evolution, in the Automotive sector

Category of skills	*Skills*	*Direct supervisors' perception (*)*	*Workers' perception by job families (**)*		*Global estimations / researches (***)*
Basic skills	Active listening	↑	↓ Quality assurance	↑ Support and administrative operations	
	Communication	↑	↓ Maintenance, Car part and body production	↑ Dyeing Assembly Installation, Support and administrative operations	↑
	Manual dexterity, resistance, precision	↓	↓ ÎMaintenance	↑ Dyeing	↓
	Responsivenes	↓	↓ Logistics		
	Concentrated attention	→	↓ Logistics, Assembly / Installation, Quality assurance		
	Visual acuity	↓	↓ Logistics, Maintenance, Support and administrative operations	↑ Dyeing	
	Colour discrimination	↑		↑ Dyeing	
	Movement control	↓			
	Order control	↑	↓ Logistics		
	Information organisation	↑	↓ Assembly / Installation Quality assurance		↓
	Spatial orientation	↓	↓ Quality assurance		
	Perceptual speed	↑	↓ Assembly / Installation, Quality assurance		
	Performance monitoring	↑	↓ Quality assurance, Logistics		
Social skills	*Coordination*	↑			
	Instruction	↑			
	Persuasion	↑			↑
	Social receptivity	↑			↑
	Customer orientation	↑			↑
Cognitive skills	Critical thinking	↑	↓ Logistics		↑
	Problem identification	↑	↓ Logistics, Car part and body production		
	Pattern identification	↑	↓ Quality assurance	↑ Dyeing	
	Reasoning and decision making	↑	↓ Quality assurance		↑
	Deductive reasoning	↑			↑
	Inductive reasoning	↑			↑
	Complex problem solving	↑	↓ Car part and body production Quality assurance		↑
Management skills	Time management	↑		↑ Support and administrative operations	
	Material resource management	↑			
Technical / digital skills	Scientific approach	↑			
	Equipment selection	↑			
	Quality control analysis	↑			
	System analysis	↑			↑
	Service / technical problem solving	↑	↓ Logistics Quality assurance		↑
	System evaluation	↑			↑
	Installation	↑			↑
	Equipment maintenance	↑	↓ Logistics		↑
	Operation monitoring	↑	↓ Logistics		↑
	Operation and control	↑	↓ Logistics		↑
	Technological design	↑			↑
	Use of software	↑	↓ Logistics	↑ Maintenance	↑
	Repair	↑			

(*) Source: The perspective of the direct supervisors of analysed jobs with regard to the skills to grow or decrease in importance due to the technological evolution
(**) Source: The employees' perspective with regard to the analysed skills to grow or decrease in importance. The skills not belonging to a job family did not register a sufficient scoring so as to be differentiated against the answer average of the analysed industry, as per the data analysis and processing (with regard to the growth or decrease in importance and/ or to the relevance for that job family, based on the job analysis)
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World Economic Forum, "The Future of Jobs Report 2020", 2020
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The skills with no mentioned trend did not register sufficient relevant sources so as to be mentioned.

The Oil and Gas sector

Table 27: Comparative image of the skill importance dynamics, in the context of the technological evolution, in the Oil and Gas sector

Skill category	*Skills*	*Direct supervisors' perception (*)*	*Employees' perception (**)*		*Global research prognosis (***)*
Basic skills	Active listening	↑	↓ Control and dispatch	↑	
	Active learning	↑	↓ Control and dispatch		↑
	Communication	↑	↓ Support and administrative operations		↑
	Manual dexterity, resistance, precision	↑			
	Performance monitoring	↑	↓ Production	↑ Geology and eploration, Support and administrative operations, Control and dispatch	
	Concentrated attention	↑			
Social skills	Coordination	↑	↓ Support and administrative operations		
	Instruction	↑	↓ Support and administrative operations		
	Negotiation	↑			
	Persuasion	↑	↓ Refining	↑ Support and administrative operations	
	Customer orientation	↑		↑ Support and administrative operations	
	Social receptivity	→		↑ Support and administrative operations	
Cognitive skills	Flexibility	↑		↑ Geologie și explorare, Operațiuni suport și administrativ	↑
	Critical thinking	↑	↓ Refining Production		↑
	Complex problem solving	↑			↑
	Deductive reasoning	↑		↑ Support and administrative operations Geology and exploration, Control and dispatch	↑
	Inductive reasoning	↑	↓ Refining	↑ Geology and exploration Support and administrative operations, Control and dispatch	↑
	Reasoning and decision making	↑	↓ Control and dispatch		↑
	Originality	↑			↑
	Problem identification	↑	↓ Support and administrative operations		
Management skills	Human resource management	↑	↓ Control and dispatch		↑
	Time management	↑	↓ Support and administrative operations		↑
	Financial resource management	↑	↓ Refining		
	Material resource management	↑	↓ Control and dispatch		↑
Technical and digital skills	Scientific approach	↑		↑ Geologie și explorare	
	Equipment selection	↑			
		↑	↓ Support and administrative operations, Control and dispatch, Production		
	System analysis	↑			↑
	System evaluation	↑			↑
	Installation	↑			↑
	Equipment maintenance	↑	↓ Control and dispatch	↑ Refining, Production	↑
	Operation monitoring	↑	↓ Support and administrative operations, Production	↑ Refining	↑
	Operation and control	↑			↑
	Technological design	↑			↑
	Repair	↑		↑ Refining	
	Service / technical problem solving	↑			↑
	Use of software	↑			↑

(*) Source: The perspective of the direct supervisors of analysed jobs with regard to the skills to grow or decrease in importance due to the technological evolution
(**) Source: The employees' perspective with regard to the analysed skills to grow or decrease in importance. The skills not belonging to a job family did not register a sufficient scoring so as to be differentiated against the answer average of the analysed industry, as per the data analysis and processing (with regard to the growth or decrease in importance and/ or to the relevance for that job family, based on the job analysis)
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