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# METAL SECTOR REPORT

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## Abstract

The fourth industrial revolution, Industry 4.0, has already begun and is based on digitization, automation, networking and flexible production processes.

It has a prospect of increasing productivity through automation and data exchange in production technologies based on digital technology.

The metal industry sector is directly affected by industry 4.0 and items through the new production lines are being transformed with automated processes and digital control systems with the least possible presence of natural persons.

Work organization and processes are changing, due to the increase in automation and digital real-time production control systems. Changes affect job content, job profiles, and the interaction and communication between people and technology media.

Industry 4.0 also requires a new quality of IT know-how. Achieving this would involve the modernization of countless professions and possibly the creation of some new ones. This has many implications for workers and users and training providers throughout the vocational training system.

Factcheck project looking for the most wanted occupational profiles and skills are needed to work in a steady high quality in the metal industry today and in five years in the future. Through the results, will be examined the new perspectives and requirements created for trainers and trainees and the adaptation that will be needed in vocational training systems.

## Introduction

The transformation of the metal industry sector has been underway through digitization and automation of production systems for several years. The digitization of production and related management and planning information systems is combined with the automation of the use of data from production lines by machines. There are already compelling indicators of digitization progress within the economy.

In this context, the Factcheck project aims to develop a European Training Module taking into account the results of the survey presented in this document on the skills most demanded by companies in the metal sector. This training module will include relevant aspects of Industry 4.0. in the sector, such as artificial intelligence, robotics and automation and digitization of processes

Within this rapidly developing environment that is being created, vocational education and training will have to face the challenges and follow the developments to provide the required knowledge and skills to educators and learners.

The new technological environment requires increased skills in information technology as well as control and problem-solving abilities. Current occupational profiles in metallurgy, particularly those of mechatronics technician and production technologist, reflect this change in some ways.

The increased know-how in the field of information technology that is necessary to handle the new production systems, requires the modernization of most professional profiles as well as the creation of new modern specialties to cover the new sectors that are created.

In order for this transition to be successful, vocational education and training providers should have direct cooperation with the businesses in the sector, so that they can manage to develop profiles with the corresponding upgraded qualifications and specialization, which will help to ensure the professional security of employees.

## 2. Steady state of metal labor market

The metal labor market in Europe has witnessed a steady state over the past few years. This stability can be attributed to various factors such as consistent demand, technological advancements, and a skilled workforce.



Firstly, the metal industry in Europe has been thriving due to the constant demand for products and services. The construction sector, automotive industry, and aerospace sector heavily rely on metal for their operations. As these industries continue to expand and develop, the need for metal workers remains steady. This consistent demand ensures job security and stability in the metal labor market.

Secondly, technological advancements have played a significant role in maintaining the steady state of the metal labor market. Automation and digitalization have transformed the metal industry, making it more efficient and productive. With the introduction of advanced machinery and tools, metal workers are required to possess a higher level of technical skills. This has created a need for upskilling and continuous learning, ensuring a sustainable workforce in the metal labor market.

Moreover, the presence of a skilled workforce has contributed to the stability of the metal labor market in Europe. Technical and vocational training programs have been successful in equipping individuals with the necessary skills to excel in the metal industry. These programs have helped bridge the skill gap and ensure a sufficient supply of skilled metal workers. Additionally, initiatives taken by governments and organizations to attract young talent towards the metal industry have further bolstered the stability of the labor market.

Furthermore, the metal industry has also been positively impacted by collaborations and partnerships between companies and educational institutions. These initiatives have facilitated knowledge exchange, research, and development, leading to advancements in metal manufacturing processes. This collaboration between academia and industry has not only improved the production capabilities but also provided opportunities for the workforce to enhance their skills.

In conclusion, the metal labor market in Europe has reached a steady state due to consistent demand, technological advancements, and a skilled workforce. This stability has been crucial in ensuring job security and opportunities for growth in the metal industry. With the continued focus on innovation and the development of skilled professionals, it is expected that the metal labor market in Europe will continue to thrive in the future.

## 2.1 Skills shortage according to CEDEFOP<sup>1</sup>

In the constantly evolving of the metal industry sector the lack of skilled workers is indeed one of the industry's biggest challenges. The rapid development of technology in the industry is affecting traditional worker specialties and creating shortages in new jobs that are created due to the demand for highly skilled personnel.

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<sup>1</sup> European Centre for the Development of Vocational Training

Here are some common skills shortages and challenges associated with machine operator job profiles in the metal industry:

**Technical skills:** For the operation and maintenance of machines such as CNC, lathes, welding machines or metal processing machines, specific technical knowledge is usually required from the workers. When there is a shortage of people with the necessary experience and technical knowledge, there is a consequent lack of skills.

**New Machinery and Automation:** In the field of construction and metalworking, old machinery has been replaced in recent years, with new advanced machinery that includes the use of automation and computer guidance. The increased use of new machines and technologies may create shortages of trained personnel who can operate and work with these machines.

**Digital transformation:** As digitization enters the metal industry in full force, machine operators and metallurgical workers will need to be able to use digital tools and software in tasks such as programming CNC machine tools or using computer-aided design software (CAD, CAM). The lack of digital literacy skills can be a challenge for the industry that needs to be addressed immediately.

**Problem Solving Skills:** Metalworkers and machine operators often face unexpected challenges on the job. Problem solving skills are vital to identifying and solving problems quickly and efficiently.

**Aging workforce:** The aging workforce in the sector's occupations is a concern in some areas. As older workers retire and there may be a shortage of younger workers to replace them. At this point, problems will arise in the training of new workers due to the vacuum that will be created by the departure of the old ones who will not be able to transfer their knowledge and experience to the new ones.

**Adaptability:** The rapid evolution of industries and emerging new technologies requires workers in these fields to be adaptable and willing to train in new skills or even change specialization to keep up with the demands of the changing work environment.

**Advanced Technology:** Industry 4.0 brings the metal industry sector new advanced technologies, through which the industry will evolve and increase its productivity. Technologies such as robotics, simulation software, 3D printing, BIM technology and virtual reality (VR), will play an important role in the metal industry sector. Making the transition to this new technological environment requires staff training and high expertise to handle these cutting-edge technologies and add value to the industry most efficiently.

Nevertheless, in the metallurgical industry there are also shortages in traditional specialties of the sector, such as machine tool operators, welders, turners and assemblers, a sign that the education and training sector should, in cooperation with industry, provide qualified personnel in these specialties in order to fill the gaps where they occur.

As a conclusion, the challenges of the future in the metal industry sector require direct cooperation of the industry with educational institutions and education and training providers, in order to create the corresponding conditions through structures and educational tools, to upgrade the work profiles of the workers and their training, so that they can cope with the new working environment that is being created.

## 2.2 Skills development (SME needs according to OECD)

Skills development is a crucial area for Small and Medium-sized Enterprises (SMEs) as it plays a significant role in enhancing their competitiveness and sustainability. The Organization for Economic Co-operation and Development (OECD) recognizes the following needs for SMEs concerning skills development:

1. Identifying skills gaps: SMEs often face challenges in identifying the specific skills required for their business operations. They may lack resources or expertise to assess their current workforce's skills and determine the gaps that need to be filled. The OECD focuses on supporting SMEs in identifying these skills gaps to develop effective training programs.
2. Access to training programs: SMEs may struggle to access appropriate and affordable training programs tailored to their specific needs. The OECD emphasizes the importance of creating and promoting training initiatives that address the unique requirements of SMEs. These initiatives should be flexible, accessible, and offer training opportunities suitable for different stages of business development.
3. Cost-effective solutions: SMEs may have limited financial resources and face budget constraints when investing in skills development. The OECD supports the development of cost-effective solutions that provide high-quality training at an affordable cost for SMEs. This includes promoting partnerships between public and private sectors, leveraging technology-based training, and encouraging knowledge sharing between SMEs.
4. Entrepreneurial skills development: The OECD recognizes the critical role of entrepreneurial skills in SME growth and innovation. They highlight the need for SMEs to foster entrepreneurial mindsets and develop key skills such as creativity, risk-taking, problem-solving, and adaptability. The organization encourages policies and initiatives that promote entrepreneurial education and encourage SMEs to engage in entrepreneurship training programs.
5. Collaboration and networking: SMEs can benefit from collaboration with other businesses, educational institutions, and training providers. The OECD advocates for establishing networking platforms that facilitate knowledge exchange, sharing best practices, and promoting collaborations between SMEs and other stakeholders in the skills development ecosystem.

Overall, the OECD aims to provide policy recommendations and support mechanisms to address the specific skill development needs of SMEs. By focusing on these needs, SMEs



can enhance their productivity, competitiveness and adaptability in an evolving global economy.

Through the FactCheck project, an attempt is made to approach and highlight the needs of businesses in the metals sector, both at national and European level. Also, considering the new technologies that Industry 4.0 brings to the industry, an attempt is made to identify new needs that are created in the new constantly evolving work environment that is being formed.

## 2.3 Occupational specific tasks machine and tool operation

Occupational specific tasks in machine and tool operation involve the use of various machines, tools, and equipment to perform specific job functions in different industries. These tasks require knowledge and skills related to operating, maintaining, and repairing machinery and tools to ensure efficient and safe operations.

In industries such as manufacturing, construction, automotive, and aerospace, machine and tool operators play a crucial role in the production and maintenance processes. They are responsible for setting up, operating, and monitoring machines and tools to complete specific tasks, such as cutting, shaping, drilling, welding, or assembling components.

One key aspect of this occupation is the ability to read and interpret blueprints, technical manuals, and work orders. This enables machine and tool operators to understand the specifications and requirements of each task, including measurements, tolerances, and desired outcomes. They must also possess a solid understanding of the materials being used to ensure the appropriate machines and tools are employed.

Machine and tool operators are skilled in using a wide array of equipment, which may include lathes, milling machines, grinders, drills, presses, saws, welding machines, and computer numerical control (CNC) machines. They are trained to perform routine maintenance and troubleshooting on these machines, ensuring they are in proper working condition and can meet production demands.

Safety is of paramount concern in machine and tool operation. Operators must follow strict safety guidelines, wear appropriate personal protective equipment, and be aware of potential hazards associated with operating heavy machinery. They need to know emergency procedures and protocols to safeguard themselves and others in the work environment.

Precision and accuracy are key skills required in this occupation. Machine and tool operators must have a keen eye for detail and the ability to measure, align, and position materials and equipment correctly. Attention to detail allows them to produce high-quality work and ensures that the final products meet client or industry standards.



As technologies continue to advance, machine and tool operators are also expected to stay up to date with the latest technological advancements. This includes learning how to operate and maintain computerized machines and tools, as well as programming and troubleshooting them as needed.

In conclusion, machine and tool operators perform occupational specific tasks that involve the operation, maintenance, and repair of various machinery and tools. Their skills are vital in industries where precise, efficient, and safe operations are paramount. By following safety guidelines, interpreting technical documents, and utilizing their knowledge of different machines and tools, they contribute to the successful completion of tasks in manufacturing, construction, automotive, and aerospace sectors, among others.

### 3. Methodology and Analysis of Company Survey

As part of the Factcheck project, a survey was designed and implemented among workers and professionals in the metal industry sector with an emphasis on VET (Vocational Education and Training), skills and professional specific tasks.

The research aimed to understand the training needs of workers in the metal industry sector, identify the necessary skills, identify the most sought-after professional profiles and the impact of digitization and the new technologies demanded by Industry 4.0 in the sector.

The research design was done with great care to ensure the collection of relevant and reliable data. Employees in companies in the metal industry sector from five countries of the European Union participated in the research, which was necessary to take into account during the design phase in order to collect representative data. No specific boundaries were set in the target group of employees who took part in the survey, which allowed information to be collected from employees with different job roles, experience levels or departments within the companies.

The sample size was decided to be at least one hundred and fifty companies, distributed accordingly by program partner. Thus, the collection of information from at least thirty companies from each country was achieved.

A multiple-choice questionnaire was created with clear, concise and easy-to-understand questions to meet the stated objectives of the research. Multiple-choice questionnaire type was chosen because it offers simplicity and allowing the respondent to select the most appropriate option from the options provided makes it time efficient for both the creator and the respondent.

For the publication of the questionnaire, the method of online research was chosen as the most suitable for the specific case. An online survey is distinguished by its efficiency, significant cost savings, and real-time data collection and analysis by eliminating

geographical limitations. Participation in the survey is done directly, from a computer or mobile phone, by following the relevant link and the answers to the questions are completed quickly and in a short time. Also, the anonymity offered by this method allows participants to express their true opinions without fear and give unbiased answers, which is important for the reliability of the research.

After the research was completed, the data was collected and exported to excel files. Then, after cleaning and preparation, they were categorized by country and distributed to the partners of the program for further processing.

Each partner of the program, after creating graphs for all the questions, proceeded to analyze the results based on which a report was created for each country separately that analyzes and interprets the findings and draws conclusions that are aligned with the original purposes of the research.

### 3.1 Concept of the Survey

The metal industry sector has an important position in the economies of most countries worldwide. The rapid evolution of the sector, automation, digitization and the introduction of new cutting-edge technologies in it requires a trained and highly specialized workforce that can adapt to these technologies. The European project FactCheck attempts to measure the needs created by the new technological environment, by conducting research which becomes crucial for the alignment of the sector with the evolving requirements.

The project survey aimed to understand the specific training needs of workers in the metallurgy sector. By gathering data and insights directly from the workforce, it becomes possible to identify areas where training can be improved or emphasized. This not only benefits workers by enhancing their skill set and employability, but also allows the industry to maintain a competitive edge in the global market.

For employment in the metal industry sector, skills are required which should be upgraded according to the evolution of the sector. The survey determines which skills are most critical in the industry, be it technical skills, soft skills or a combination of both. By identifying the necessary skills, training programs can be tailored to meet these requirements, ensuring that the workforce remains equipped with the skills required to work to the high standards of the industry.

A key aspect of the research was to identify the most sought-after professional profiles in the metallurgy sector. By understanding the demand for specific profiles, industry can align its training programs to produce more professionals in these fields. This ensures a healthy supply of skilled workers to meet industry demands and bridge any existing skill gaps.

Digitization and the emergence of Industry 4.0 have had a profound impact on various industries, including the metallurgical sector. The survey measures the extent of this impact on the sector and determine the necessary skills and knowledge required to adapt to these changes. By understanding the implications of digitization, industry can prepare its workforce to effectively utilize new technologies.

## 3.2 Known Properties

The European FactCheck project is an initiative that aims to measure the needs created by the new technological environment and to align the industry with these evolving requirements. One of the key elements of this project is to conduct research to gather data and knowledge directly from the metallurgical workforce.

The aim of the research carried out as part of the FactCheck project is to understand the specific educational needs of workers in the metal industry sector. By gathering information and required knowledge directly from the workforce, it becomes possible to identify areas where training can be improved or given special emphasis. Deriving conclusions that help design strategies that will benefit workers, enhance their skill set, find work and employability in the field, but will also allow the industry to maintain a competitive edge in the new evolving environment and in the global market.

By identifying the skills that are considered most critical in the metal industry sector, whether technical skills or soft skills, solutions should be proposed to adapt training programs to meet these new requirements. So by taking these actions we ensure that the workforce remains equipped with the skills required to work to the industry's high standards.

One of the main purposes of FactCheck's survey is to identify the most sought-after professional profiles in the metals industry. By understanding the demand for specific profiles, industry can align its training programs to produce more professionals in these fields. This ensures a healthy supply of skilled workers to meet industry demands and bridge any existing skill gaps.

With digitization and Industry 4.0 having directly affected the entire industry, including the metal sector, FactCheck's survey attempted to determine the extent of this impact on the industry and highlight the necessary skills and knowledge required to adapt to these changes. Understanding the impact of digitization will enable industry to prepare its workforce to effectively use new technologies and remain at high levels of competitiveness.

After the collection of the results, in order to make proper use of them and draw useful information and conclusions, the data should be analyzed with the aim of identifying trends and understanding the impact on training and development programs. By effectively interpreting the results, agencies can make informed decisions about

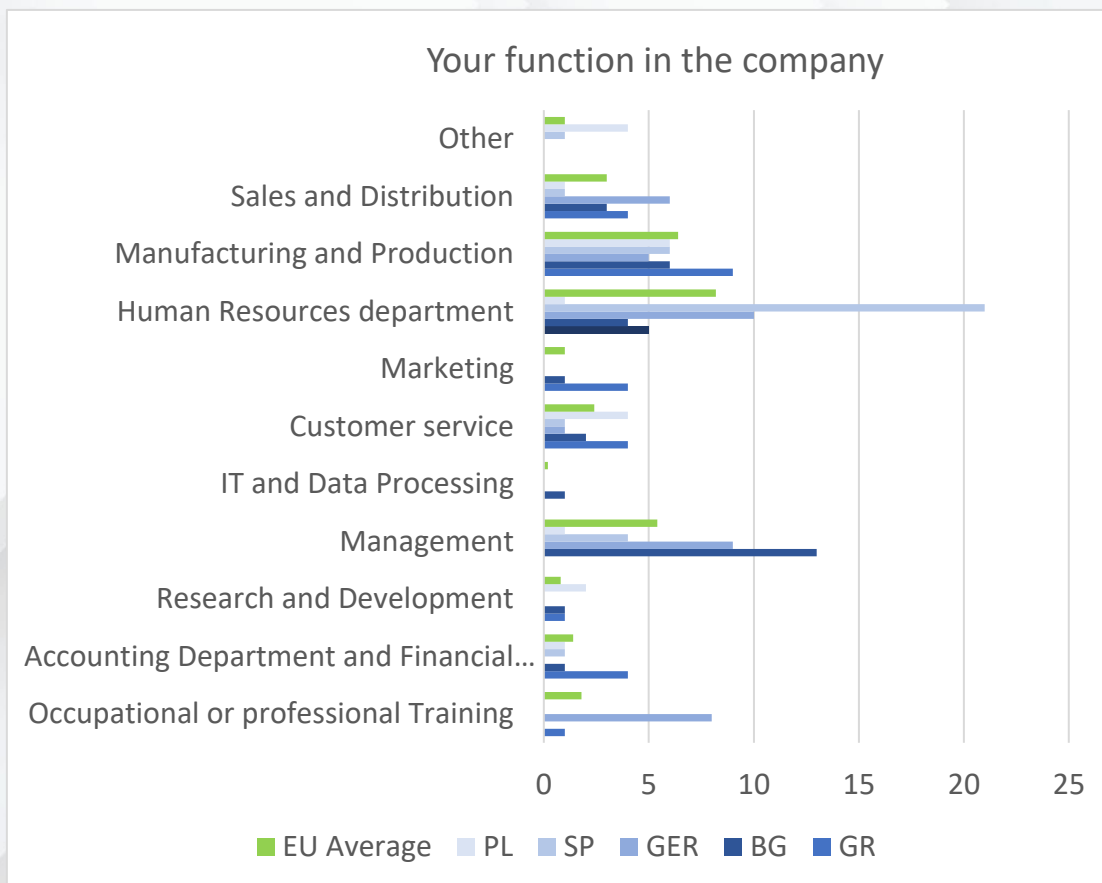


allocating resources and designing training initiatives that meet the immediate and pressing needs identified by the workforce.

### 3.3 Analysis of company feedback

Questions one and two were two introductory questions concerning the name of the company and the company profile that corresponded to the European classification, characteristics that are not necessary to draw conclusions that were needed in the research and thus are omitted from the present report.

#### Question number 3

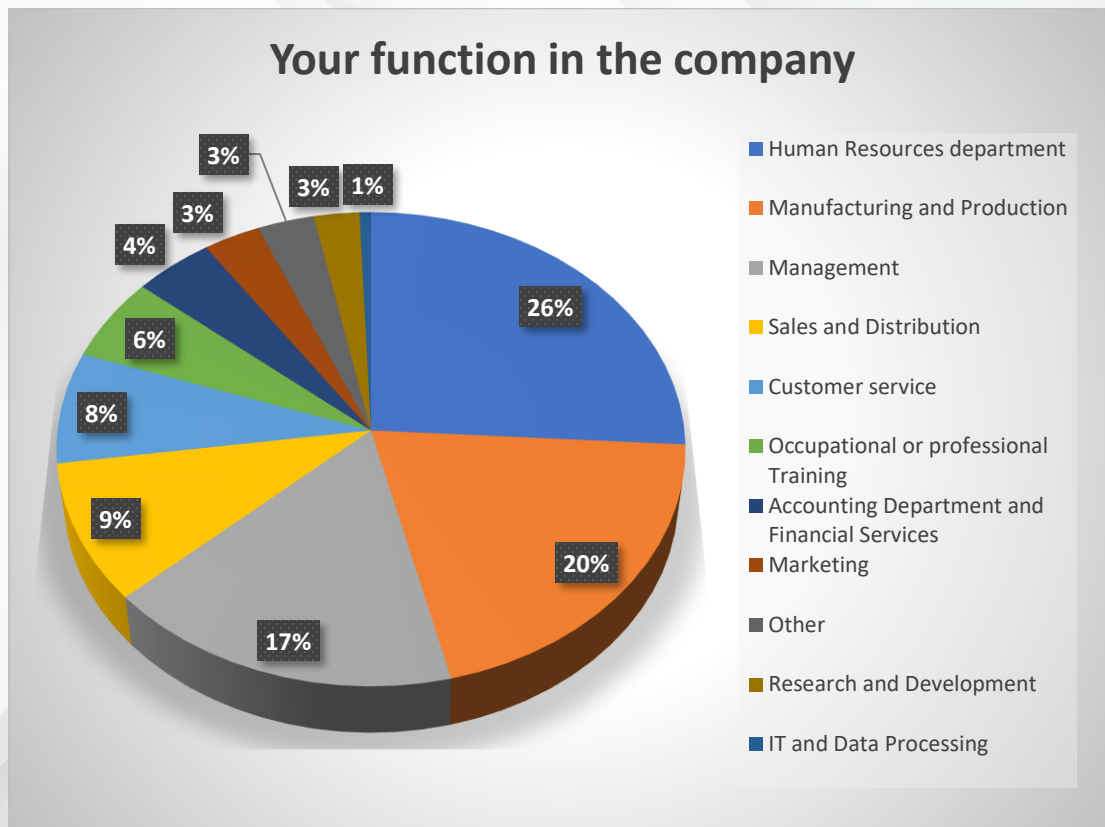


The survey collected responses from employees working in different departments within the companies that participated in the survey. By analyzing the data, we can determine which departments' employees hold the highest percentage. The results are as follows:

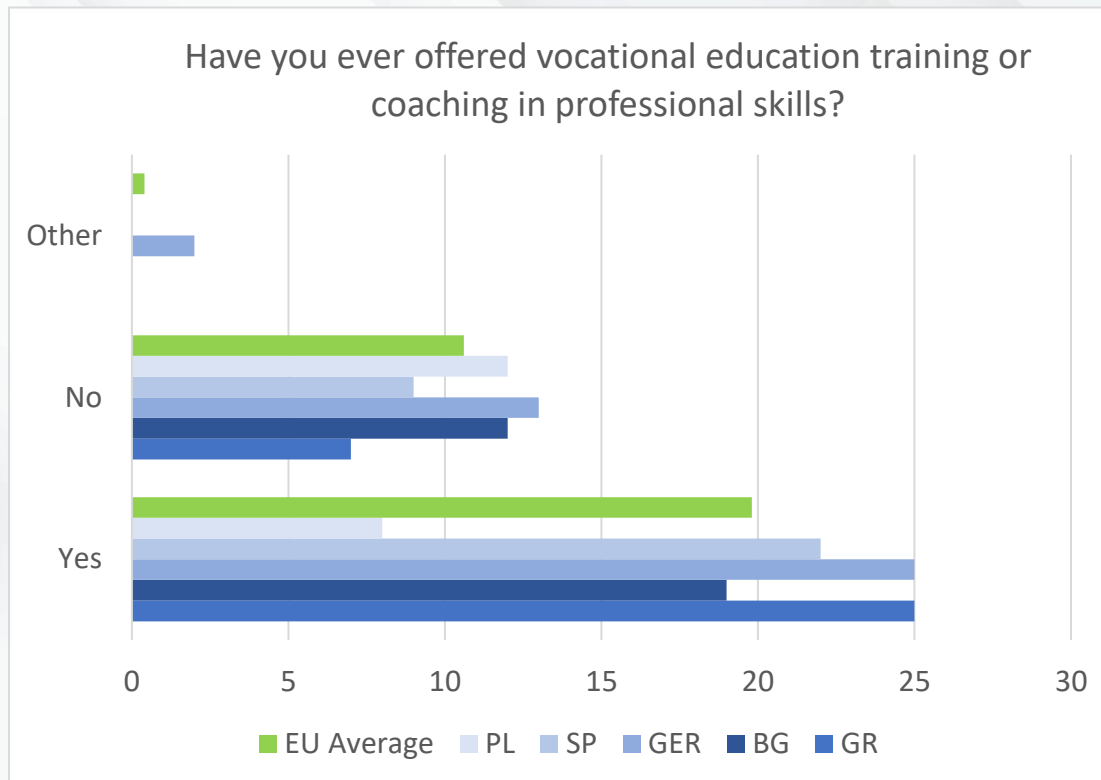
### Human Resources Department: 26%

The results of the survey show that employees of the Human Resources (HR) department occupy the largest percentage of survey participants with 26%.

After the Human Resources (HR) department, the Manufacturing and Production department represents 20% of the participants, followed by the Management department with 17%, Sales and distribution with 9%, Customer Service with 8%, Occupational or professional Training with 6%, Accounting and Financial Services with 4% and Marketing with 3%



## Question number 4



Through the survey conducted by the FactCheck project, an attempt was made to collect information of the level of vocational education training and coaching in professional skills. The survey collected responses from workers in the metal industry sector, with different backgrounds, in different sectors and work positions. The results provide valuable insights into today's vocational education landscape.

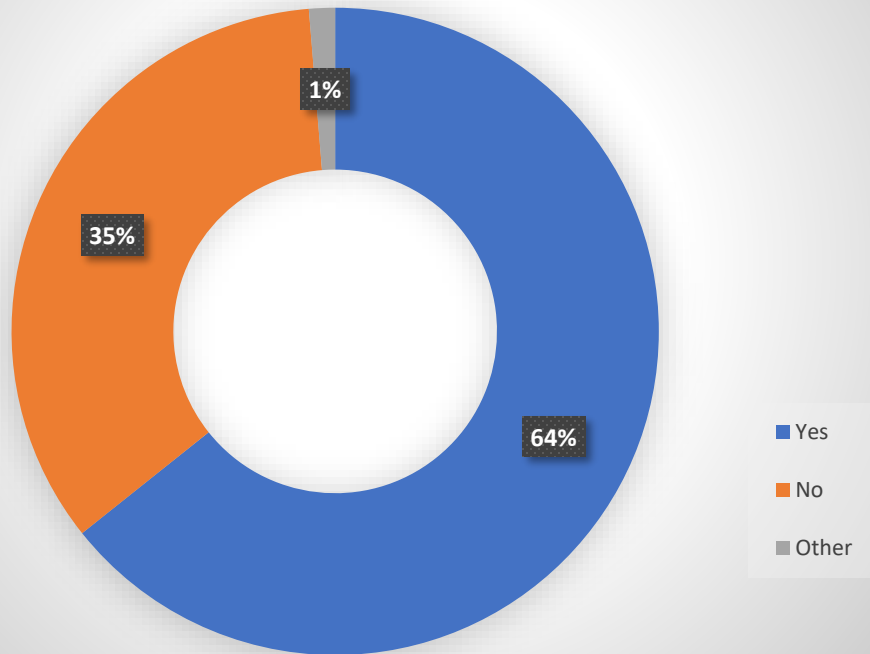
The majority of all respondents answered "Yes", at percentage of 64% when asked if they have ever been offered vocational training or guidance in vocational skills. This shows that a significant portion of workers and professionals in the sector recognize the value of such programs and have actively pursued them to enhance their career prospects.

On the other hand, 35% of respondents answered "No" to the same question, suggesting that there is still a fairly large percentage of people who still do not have access to training or vocational education.

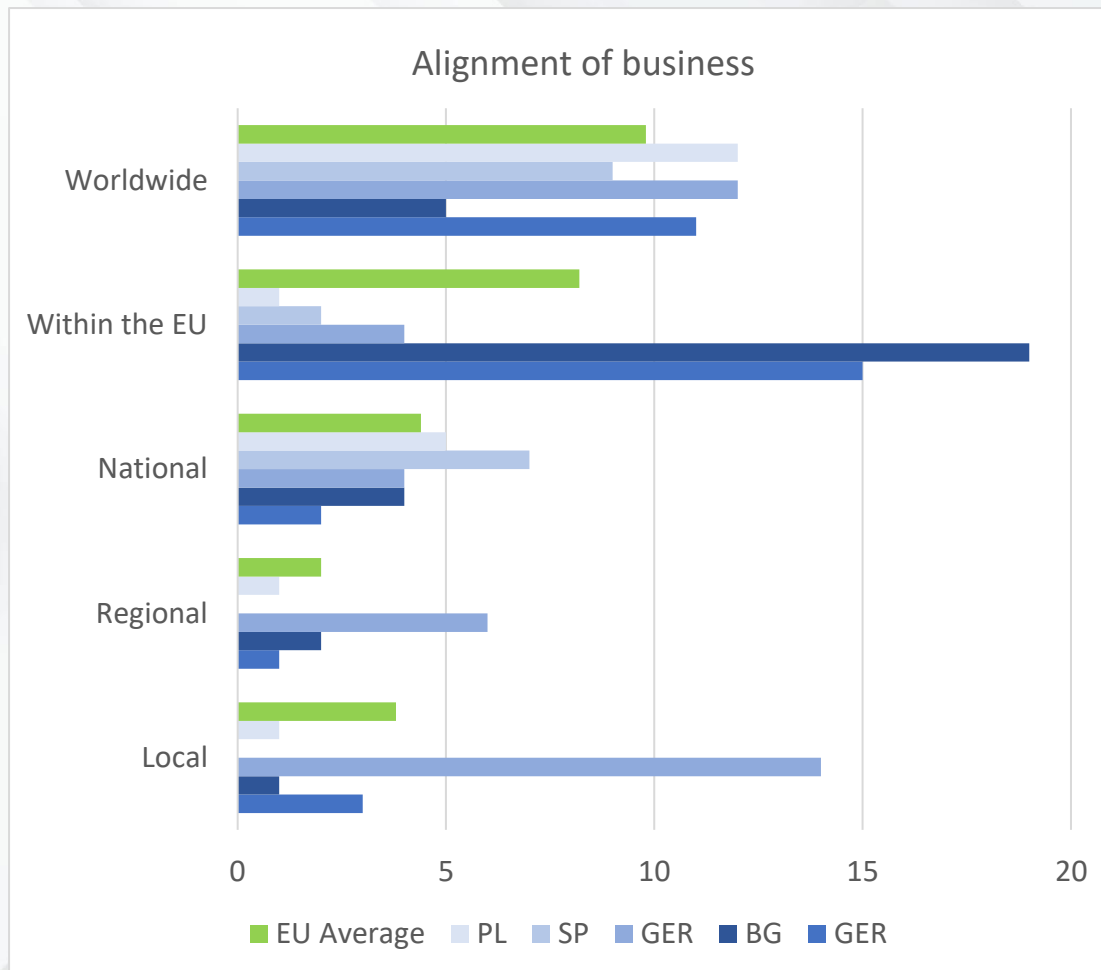
Finally, only 1% of the respondents belonged to the "Other" category. This could include people who have received informal or non-traditional forms of vocational training.



## Have you ever offered vocational education training or coaching in professional skills?



## Question number 5



The FactCheck project, through the results of the survey, wants to examine the alignment of businesses at different geographic levels and the geographic scope of their activities, from local to global.

Employees asked to indicate the extent to which their business aligned with different geographies, including local, regional, national, intra-EU and global.

The responses were analyzed to reveal trends in how businesses align.

Here's a breakdown of the percentage of businesses and how they align in each geographic region:

The largest percentage of businesses (35%) prioritize alignment with global markets. Global alignment allows companies to network with customers and explore new opportunities on a global scale. Through new technologies and modern communication

platforms, reaching customers in different parts of the world has become more accessible than ever and opens up new horizons.

The 29% of companies focus on their alignment within the European Union (EU). This alignment strategy allows organizations to benefit from the economic and regulatory framework provided by the EU. Through a diverse but interconnected market, businesses can reap the benefits of the free movement of goods, services and capital within the EU.

A significant percentage of businesses (13%) are locally aligned. This shows that many companies still recognize the importance of meeting the specific needs and preferences of local markets and are oriented towards them, despite the high level of market globalization.

On the other hand, alignment at regional, national or intra-EU level allows businesses to benefit from greater market opportunities.

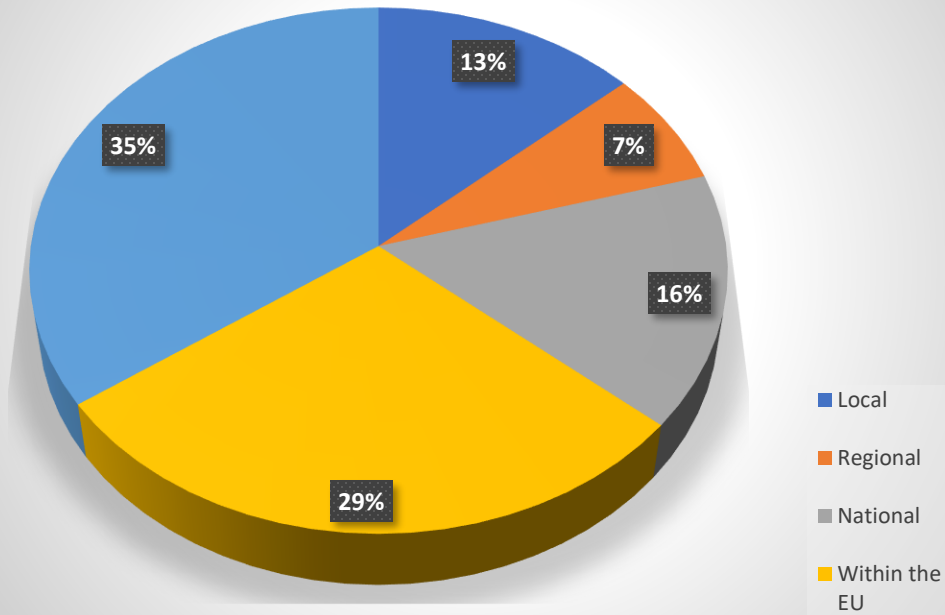
Only 7% of the companies surveyed focus on the regional market. These companies understand the importance of expanding beyond local borders and tapping into a wider customer base.

While regional alignment is relatively low, a significant proportion of companies (16%) are nationally aligned, indicating the importance of domestic markets. By expanding their reach across the country, companies can access a larger consumer base and tap into different customer preferences.

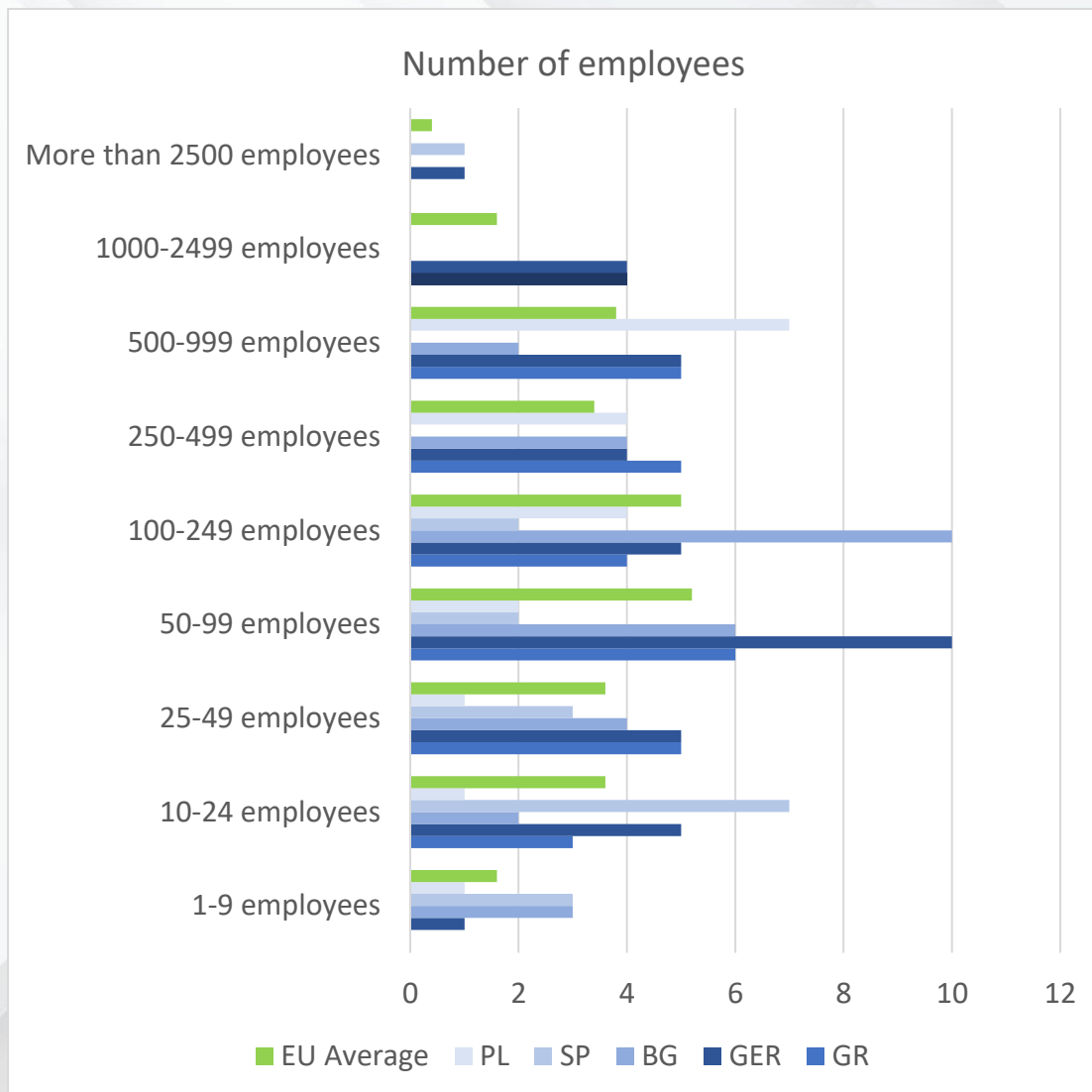




## Alignment of business



## Question number 6



Understanding the number of employees in different companies provides valuable insights into the scale, structure of businesses and their potential impact on the economy.

According to the survey, the largest share of businesses fall in the range of 50 to 99 employees. This scale includes small and start-up businesses that typically have a limited workforce but play vital roles in the economy. Together, the top five categories represent 68% of the companies surveyed, highlighting the important position of small and medium-sized enterprises (SMEs).

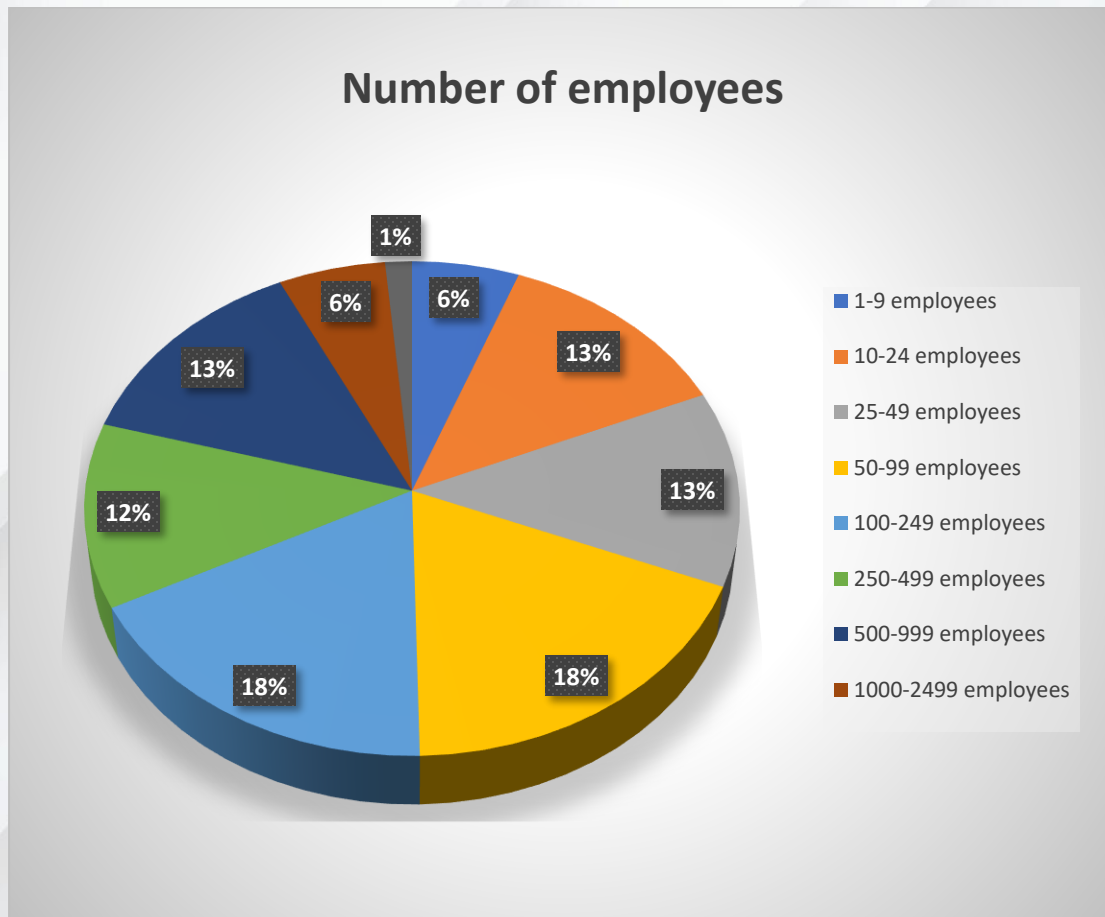
While small companies make up the majority of respondents, the data reveals the presence of a significant number of larger companies as well. The categories 100 to 249 employees, 250 to 499 employees and 500 to 999 employees make up a total of 43% of

the sample. These companies operate on a larger scale and often have a greater impact on the labor market.

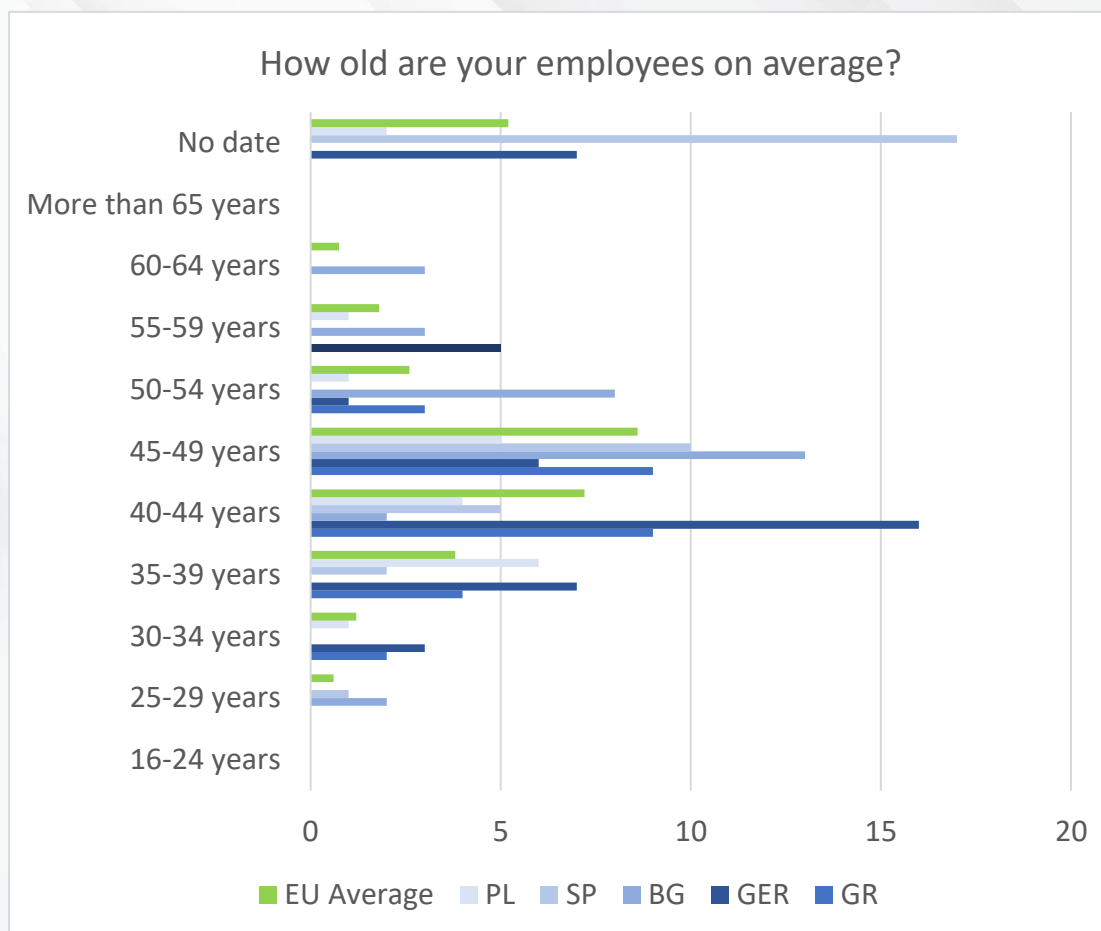
It is important to note that companies with more than 2500 employees are relatively rare, representing only 1% of the total. These companies are usually huge corporations known for their extensive reach and significant influence in the global market.

The distribution of employees in companies of the sector with different potential and size, reflects the diversity and dynamics of the labor market.

The highlighting of small companies shows how important it is to support and nurture these companies, as they contribute significantly to job creation and innovation. At the same time, the presence of larger companies suggests the need for policies that encourage the growth and sustainability of companies that play vital roles in the economy.



## Question number 7



Collecting and understanding the demographics of workers in the metal industry is essential. Knowing the average age of your workforce can provide valuable insights into factors such as employee retention, training needs and industry dynamics.

According to the research carried out through the FactCheck project, data was collected on the age distribution of employees in different age groups. The survey respondents represented a wide range of industries and companies in Europe. Below are the results of the research as they are structured by age groups of employees.

Workers in the 45-49 age group represent the largest proportion, making up 27% of the workforce. This age group usually includes experienced workers who have acquired extensive knowledge and expertise in their subject matter, which could prove invaluable for running the business as well as mentoring younger workers.

The 40-44 age group amounts to 23% of employees. These individuals are also likely to have significant professional experience. They are the link between senior and junior



employees, providing valuable knowledge while maintaining an outlook for new ideas and development.

Workers aged 35-39 make up 12% of the workforce. This group represents individuals who are likely to be at a pivotal stage in their careers, seeking opportunities for career advancement and growth. Recognizing the unique needs and aspirations of this age group can help engage and retain employees.

The results of the survey show that 8% of the employees fall into the 50-54 age group. These workers have likely accumulated a wealth of knowledge and experience throughout their careers. Utilizing their expertise and skills can contribute to providing different perspectives within the company.

Workers aged 55-59 make up 6% of the workforce. This age group often represents a transition period where workers may begin to consider retirement options. It is important for employers to begin their succession planning and leverage the wisdom and experience these employees have gained over the course of their careers.

About 4% of employees are between 30-34 years old. This younger workforce can bring fresh perspectives and innovative ideas to the industry. Creating opportunities for growth and development can help retain talent and foster a dynamic work environment.

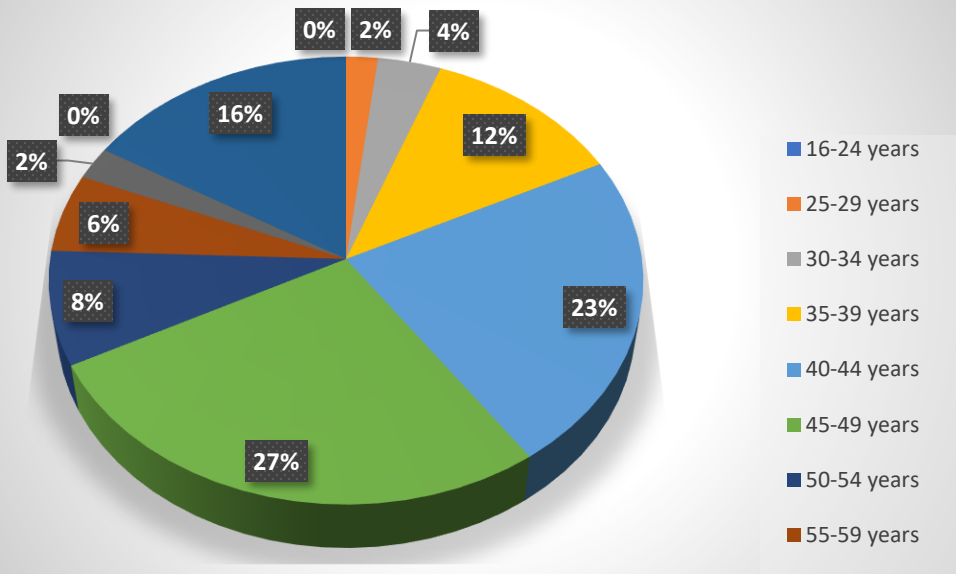
Workers aged 60-64 make up a small percentage, representing only 2% of the workforce. These individuals may choose to continue working or choose to retire at this stage. Recognizing their value and providing flexible work arrangements can help preserve their expertise while respecting their personal preferences.

Accordingly, the 25-29 age group represents another 2% of the workforce. These workers often bring energy and enthusiasm to the workplace. Offering education and training programs and opportunities for development can help realize their potential and nurture new talent.

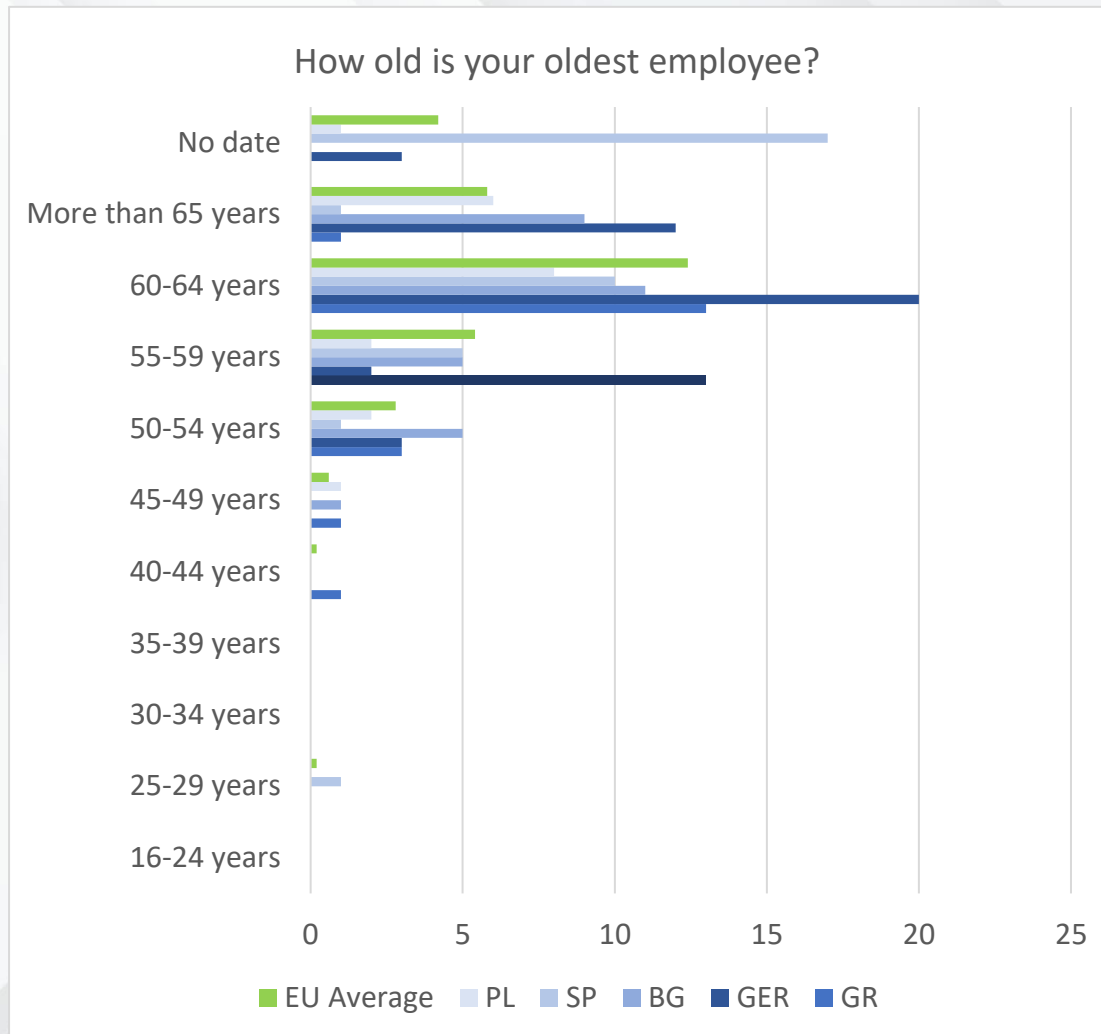
Also, the survey did not identify respondents in the 16-24 age group, as well as workers over 65 years old. Surprisingly, 16% of respondents did not provide information on the age of their employees.



## How old are your employees on average?



## Question number 8



The results of the survey revealed that the majority of companies, comprising 40%, have their oldest employee between the ages of 60-64. This suggests that many companies value the expertise and experience of their older employees.

This is followed by 18% of the companies in which it is recorded that their oldest employee is in the over 65 category. This highlights a growing trend of people choosing to continue working beyond the traditional retirement age, contributing their knowledge and skills to the workforce.

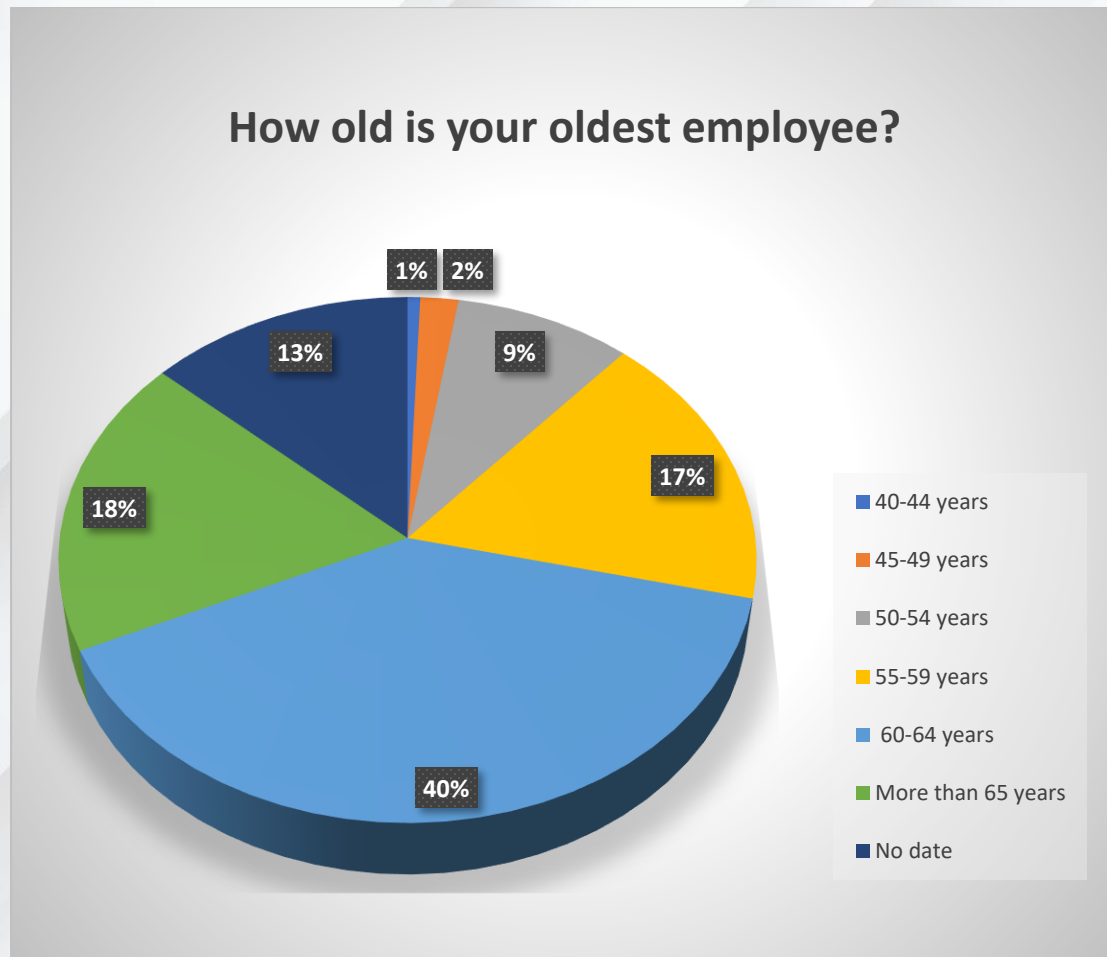
Other notable age groups included 17% of companies having their oldest worker in the 55-59 age group, highlighting the importance of this age group's contribution.

In addition, 9% of companies reported that the oldest employee was between 50-54 years old, demonstrating a continued presence of experienced individuals in the workforce.

On the other hand, only 2% of companies had their oldest employee between the ages of 45-49 and 1% of companies had their oldest employee aged 40-44, indicating lower representation in this age group.

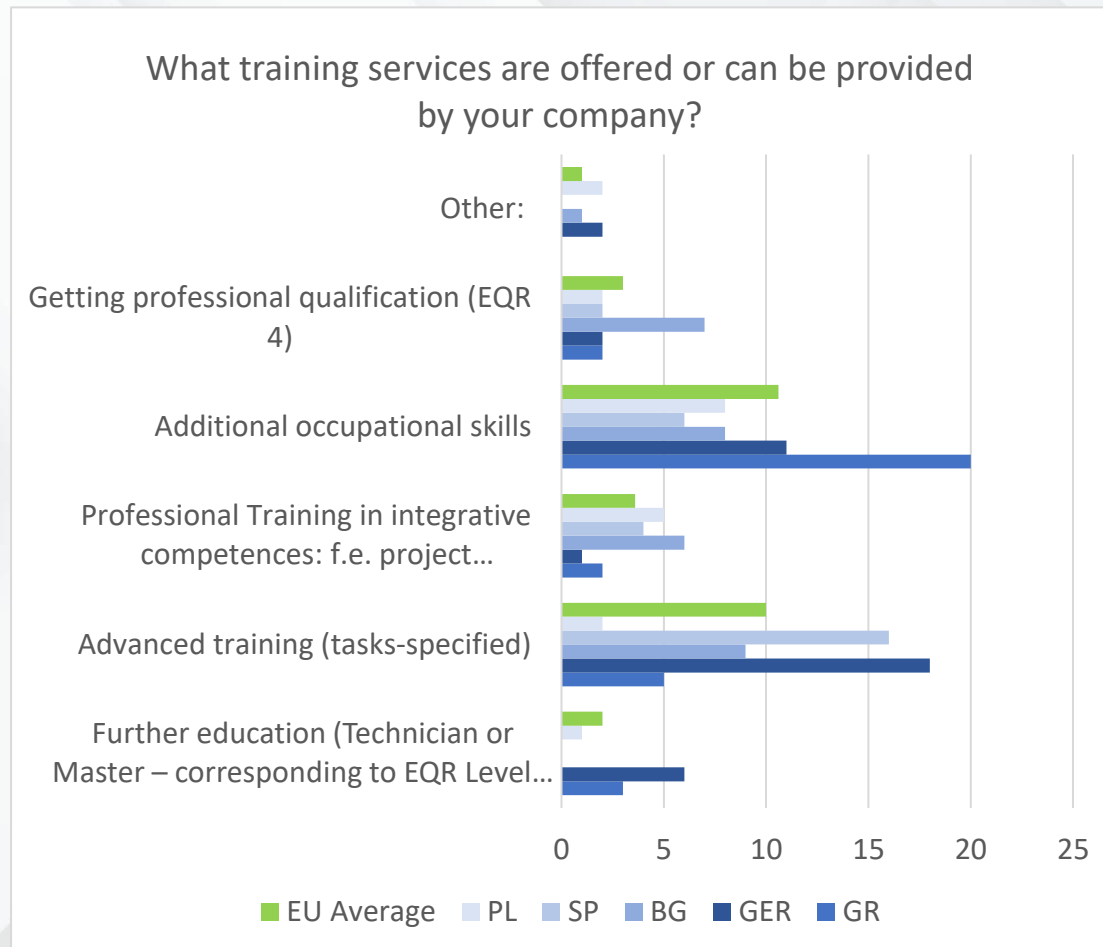
It is worth noting that younger workers also contribute to the workforce. Although the percentages may be relatively lower, 1% of companies reported having their oldest employee in the 25-29 age group, indicating the inclusion of younger talent in organizations.

Interestingly, 13% of respondents did not provide specific data, suggesting a need for better record keeping and data collection practices.





## Question number 9



The aim of the survey was to explore the range of training opportunities available to workers and the importance placed on different types of training. The results show the various training programs that companies offer to enhance the skills and knowledge of their workforce. Here is an overview of the percentages for each category:

**Additional Professional Skills - 35%** : The majority of survey respondents recognize the importance of enhancing the professional skills of employees. Training programs in this category provide workers with additional skills that complement their primary job functions. By broadening their skills, employees become more flexible and capable of handling various tasks in their work area.

**Advanced training (specified tasks) - 33%** : More than a third of respondents prioritize advanced training that focuses on specific tasks or job-related skills. This type of training is tailored to the unique needs of each position in the company. By empowering

employees in their specific roles, companies can improve operational efficiency and ensure competence in critical areas.

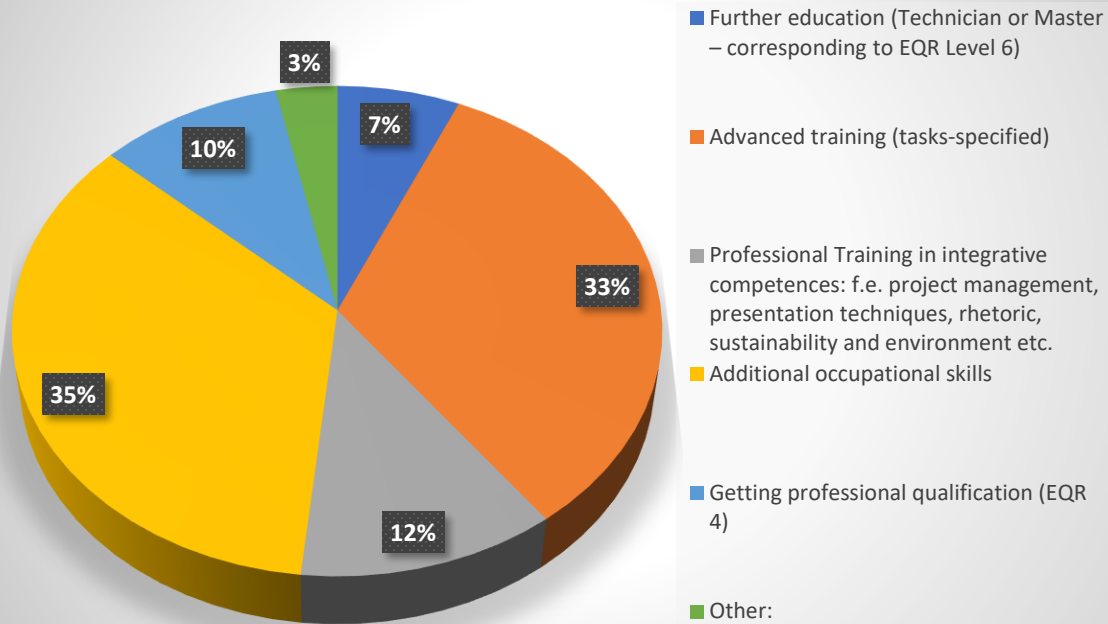
Vocational Training in Integrative Skills - 12% : About 12% prioritize training programs that cultivate integrative skills. These programs go beyond job-specific skills and focus on developing broader professional attributes such as leadership, teamwork, communication and problem solving. Comprehensive competency training helps employees adapt to changing work environments and assume flexible roles within companies.

Obtaining professional qualifications (EQR 4) - 10% : A 10% share focuses on offering training programs that enable employees to obtain professional qualifications equivalent to the European Qualifications Framework (EQF) Level 4. These programs provide individuals with the necessary knowledge and skills to develop in their chosen field. By supporting employees in the pursuit of professional qualifications, companies demonstrate their commitment to individual development and industry standards.

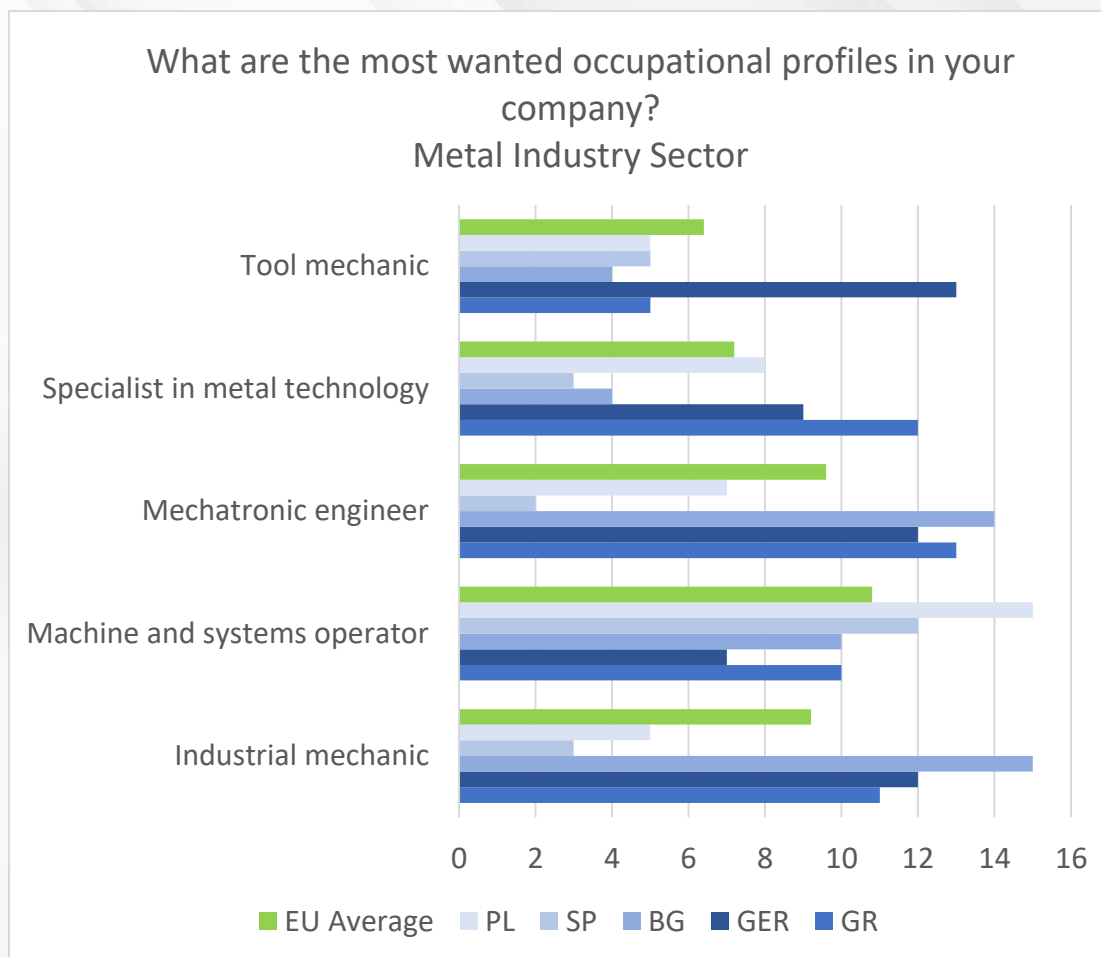
Higher Education Qualifications (Technician or Master) - 7% : Companies recognize the value of continuing education and encourage employees to pursue higher qualifications. This category includes training programs that help people obtain Technician or Master level certifications, equivalent to the European Qualifications Framework (EQF) Level 6. By investing in further education, companies aim to enhance the know-how of their employees and support professional their development.

Other - 3% : A small percentage of companies provide additional training services not covered in the above categories. These training programs may address specific needs that are unique to the respective organizations or offer specialized certifications that have value in specific industries.

## What training services are offered or can be provided by your company?



## Question number 10



To create a successful and efficient workforce in the metal industry sector, identifying the most wanted occupational profiles is crucial. Hiring the right professionals with the right skills and expertise can significantly impact industry productivity, growth and success.

FactCheck project survey, attempt to highlight the top professional profiles that companies in the industry are looking for today.

**Machine and Systems Operator (25%)** : Operating complex machinery and systems requires precision, attention to detail and technical know-how. Machine and system operators are responsible for setting up, monitoring and maintaining equipment to ensure optimum performance. The results show that 25% of companies are looking for qualified professionals in this field.

**Mechatronic engineer (22%)** : The rise of automation and advanced technology has made mechatronic engineers in high demand in many industries. These professionals





possess interdisciplinary knowledge in mechanical, electrical, and computer engineering, enabling them to design, develop, and maintain state-of-the-art automated systems. The survey reveals that 22% of companies are actively seeking mechatronics engineers to drive innovation and efficiency.

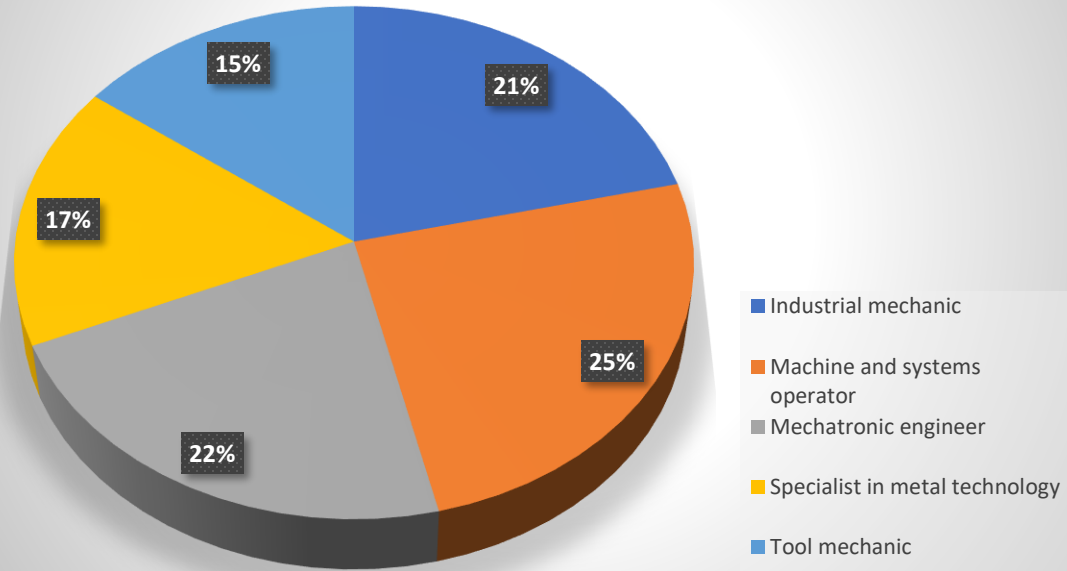
**Industrial Engineer (21%)** : An industrial engineer plays a critical role in ensuring the smooth running of machinery and equipment in a variety of industries. These professionals possess excellent technical skills, problem-solving abilities and deep knowledge of mechanical systems. With a demand rate of 21%, it is evident that companies are in dire need of industrial engineers in their workforce.

**Metal Technology Specialist (17%)** : In industries that rely heavily on metal fabrication, metal technology specialists are in high demand. These specialists have specialized skills in welding, machining and other metalworking techniques. They ensure the quality and precision of metal products, contributing to the success of various industrial sectors. The survey highlights a 17% demand rate for metal technology specialists.

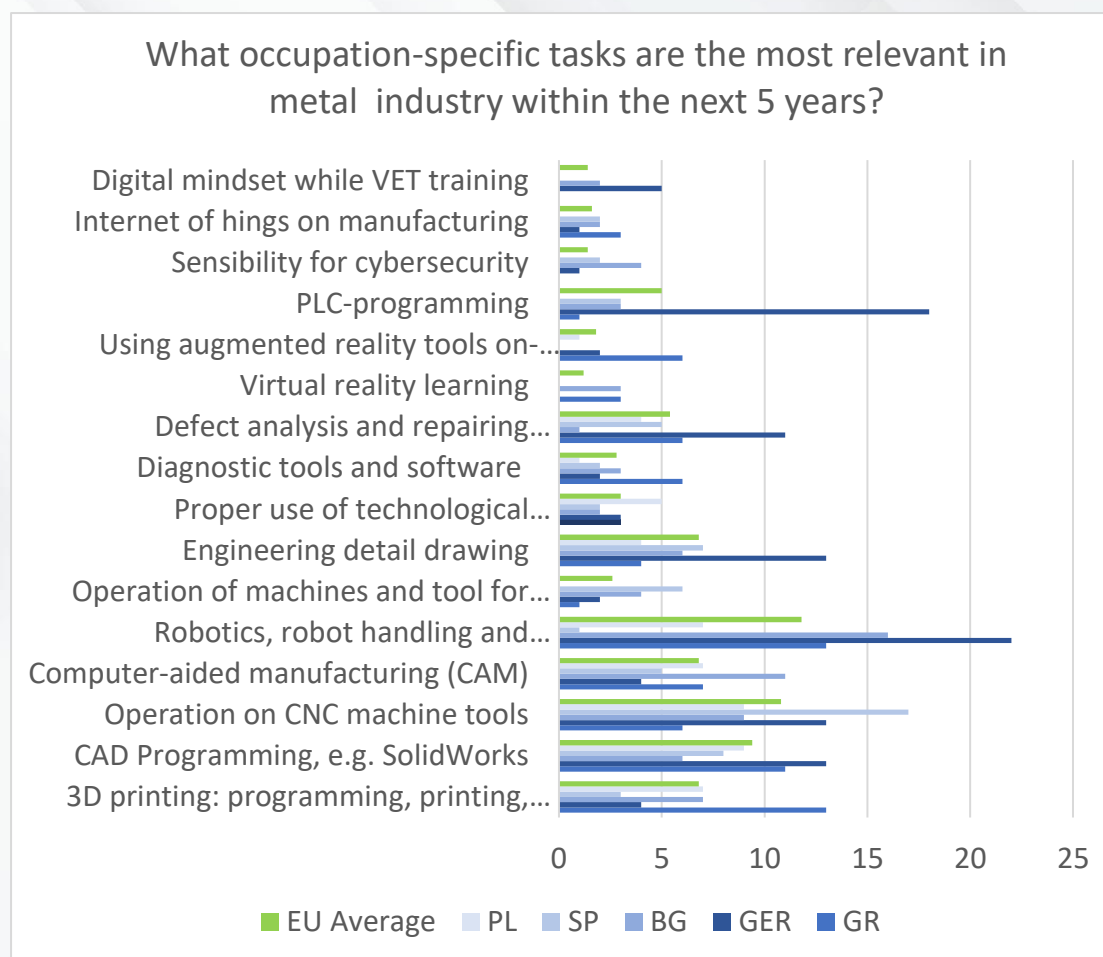
**Tool Engineer (15%)** : Tool mechanics have main role in the maintenance and repair of various tools and equipment used in industries. These professionals possess a deep understanding of mechanical systems and are skilled at troubleshooting and performing effective repairs. With a demand rate of 15%, recognized by companies the importance of skilled tool mechanics in their workforce.



## What are the most wanted occupational profiles in your company? Metal



## Question number 11



The results of the survey highlight the tasks that will be critical in the metallurgical industry in the next five years. Here are the basic tasks for specific occupations and their percentages:

**Robotics: Robot Manipulation and Automation (17%):** Robotic technologies have revolutionized the metal industry by improving productivity and efficiency. So the ability to operate robots and understand their applications will be extremely important in the next five years. Companies will be looking for professionals who can effectively operate, program and maintain these advanced systems.

**Operation on CNC machine tools (15%):** Computer Numerical Control (CNC) machine tools offer great precision and flexibility. Consequently, the ability to operate and program CNC machine tools is highly sought after in the metal industry. Professionals skilled in CNC operations will play a critical role in production processes and quality assurance.

**CAD programming (13%):** Computer-aided programming (CAD) is a key skill set for designing and creating digital models of parts and products. As the industry increasingly incorporates digitization, professionals with expertise in CAD programming will be valuable in developing innovative and effective solutions.

**3D printing (9%):** 3D printing has gained enormous popularity in recent years. This technology enables the production of complex and customized parts, reducing waste and production costs. Consequently, people with knowledge of 3D printing will be in high demand to optimize production processes and drive innovation.

**Computer Aided Manufacturing (9%):** Computer-Aided Manufacturing (CAM) systems bridge the gap between design and production by automating various production processes. Proficiency in CAM software and systems is necessary to achieve efficiency and accuracy in the metals industry over the next five years.

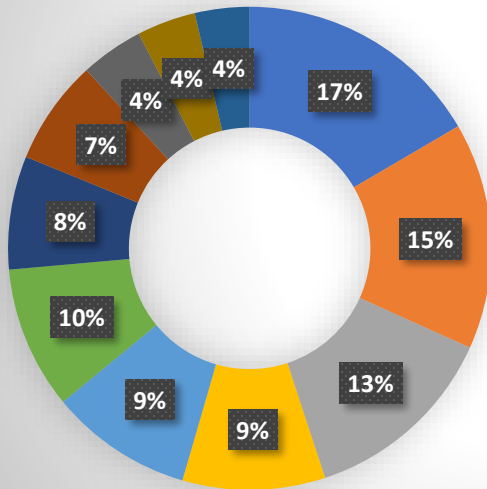
**Technical Detail Design (10%):** Accurate and detailed engineering designs are one of the most important sections of the metal industry. Professionals skilled in mechanical detail drawing will continue to be in demand, as these drawings serve as the basis for manufacturing processes and ensure accurate production.

**Fault Analysis and Repair Machinery and Technical Equipment (8%):** Maintenance of production equipment and detection and correction of defects are key tasks in the metal industry. Professionals with expertise in defect analysis and machine repair will play a vital role in ensuring uninterrupted production and optimizing performance.

**PLC-Programming (7%):** Programmable logic controllers (PLCs) are widely used in industrial automation systems to control various processes. As the metals industry moves toward automation, professionals skilled in PLC programming will be essential to the development and maintenance of these systems.

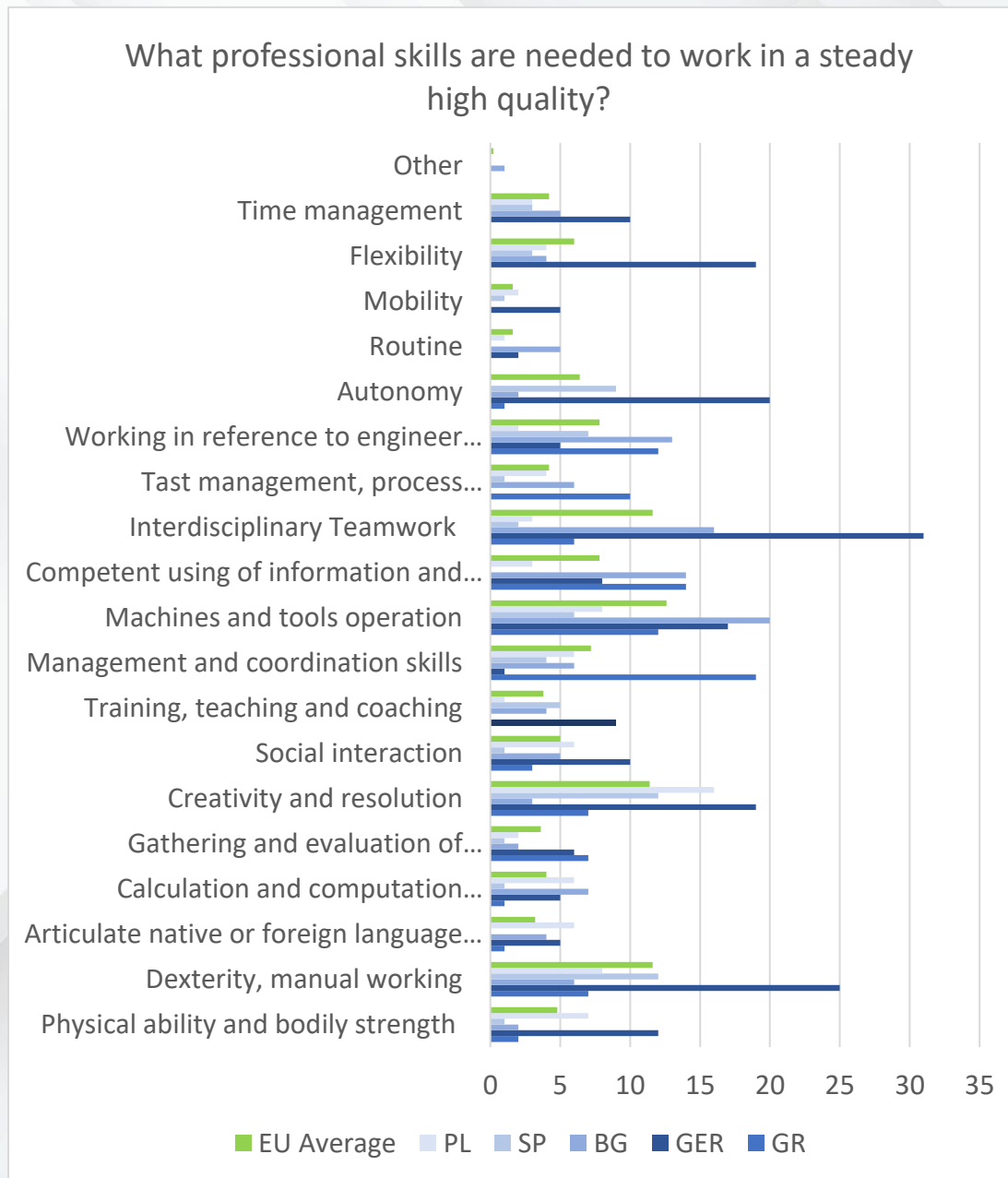


## What occupation-specific tasks are the most relevant in metal industry within the next 5 years?



- Robotics, robot handling and automation
- Operation on CNC machine tools
- CAD Programming, e.g. SolidWorks
- 3D printing: programming, printing, postprocessing
- Computer-aided manufacturing (CAM)
- Engineering detail drawing
- Defect analysis and repairing machines and technical equipment
- PLC-programming

## Question number 12



One of the objectives of the FactCheck project was to investigate the professional skills required for consistently high-quality work. The results of the respondents at the European level are presented below:

Operation of machinery and tools (12%): Skills in the operation of machines and tools are essential in various branches of the metal industry. By gaining expertise in the operation

of the equipment, the efficiency of workers increases, maximizing productivity and ensuring consistent high-quality output.

**Dexterity - Manual Labor (12%):** Manual dexterity involves the ability to perform precise movements with your hands or body. It is especially important in areas that require complex operations, such as assembly lines. This skill ensures attention to detail and the ability to produce work of exceptional quality.

**Interdisciplinary teamwork (12%):** Working in interdisciplinary teams allows the exchange of different knowledge and expertise, contributing to the overall high quality of the work. Developing collaboration, communication skills and the ability to integrate different perspectives enhances innovation and ensures effective achievement of goals.

**Creativity and analysis (11%):** Creativity and analysis play an important role in achieving high quality work. The ability to think and generate new ideas and find innovative solutions to challenges improves the overall quality of production.

**Competent use of Information Technology and Communications (8%):** In today's digital age, effective use of information and communication technology (ICT) is vital in various industries. The ability to use profession-specific software, tools and platforms enhances productivity, accuracy and the delivery of high-quality work.

**Work in relation to engineering standards, technical guidance and legal compliance (8%):** Many professions, such as engineering, require adherence to specific standards, technical guidelines and legal regulations. Working to these standards ensures the quality, safety and integrity of production. Professionals must have a deep understanding of these requirements and apply them diligently in their work.

**Management and Coordination Skills (7%):** Effective management and coordination skills are essential for professionals who work in team environments or have multiple responsibilities. The ability to prioritize tasks, allocate resources efficiently, and coordinate with colleagues leads to smoother operations and the delivery of high-quality work within defined timelines.

**Autonomy (6%):** Autonomy refers to the ability to work independently and make informed decisions. Employees with strong autonomy skills can produce high-quality work by taking responsibility for their tasks and exercising good judgment throughout the process.

**Flexibility (6%):** Flexibility is a critical skill, especially in fast-paced industries or professions that require adapting to changing conditions. Quick adaptation to changes, and ease of learning, allows professionals to maintain a high level of productivity and quality despite fluctuating conditions.

**Social interaction (5%):** Effective social interaction skills are essential for professionals in roles involving customer service, customer interactions or teamwork. Building relationships,

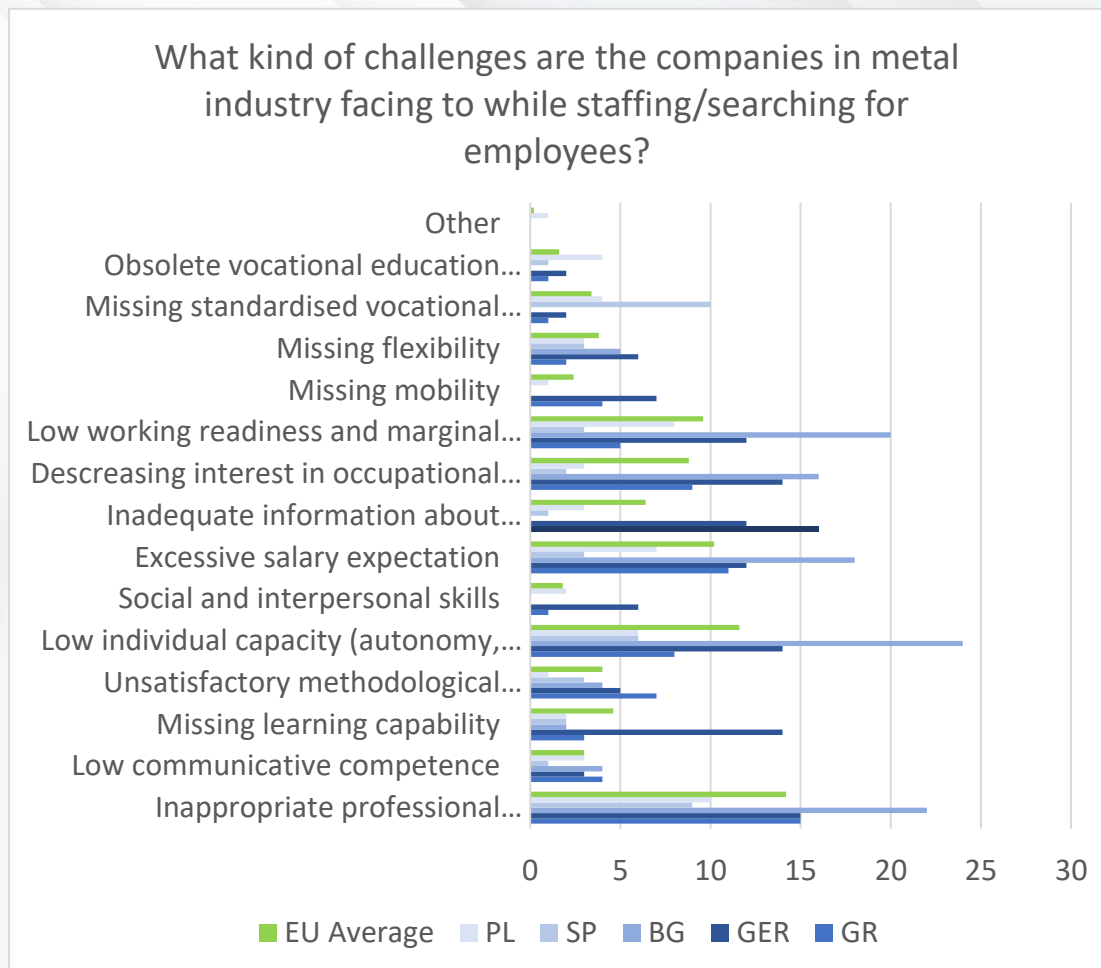
active listening and clear communication help build trust and deliver high quality service or work in collaboration with others.

Physical ability and physical strength (5%): In some occupations, physical fitness and physical strength play an important role in providing high quality work. Having the necessary physical capabilities ensures efficient execution and optimal results.





### Question number 13



Companies in the metal industry often face challenges in staffing and recruiting. Through the results of the research, some of the types of challenges are highlighted with their corresponding percentages.

**Inappropriate professional qualifications (19%):** Companies often face the challenge of finding candidates who possess the necessary skills and knowledge. A lack of qualified candidates can significantly affect workforce productivity and efficiency.

**Low individual ability (autonomy, reliability, responsibility) (16%):** Individual competence, including qualities such as autonomy, reliability and responsibility, contribute to the success of the metals industry. However, companies often face challenges in finding employees who possess these characteristics.

**Excessive salary expectation (14%):** Salary expectations can be a significant challenge for companies in the metals industry, as workers with high salary demands may not align with the company's budget or industry standards.

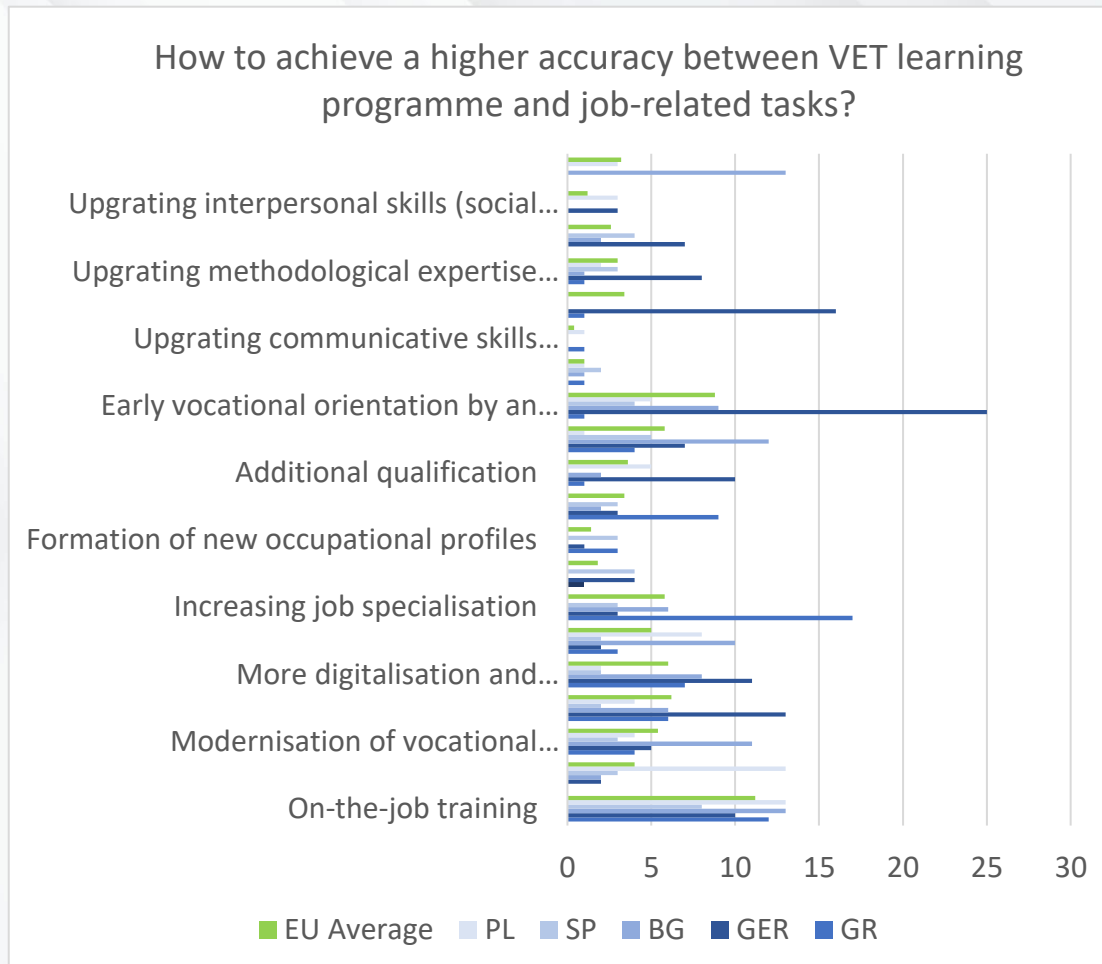
Low work readiness and marginal motivation (13%): Work readiness and motivation are essential for employees to perform their duties effectively and efficiently. Companies in the metal industry often face difficulties in finding people who are ready to work and highly motivated.

Reduced interest in professional profile (12%): The reduced interest in the professional profile is one of the challenges faced by companies in the metal industry. The industry needs to attract new talent to ensure a sustainable workforce in the new working environment that is taking shape.

Insufficient information on professional profile (9%): The metals industry has several specialized roles that may not be known or understood by job seekers. This lack of job profile information can make it difficult for companies to find candidates with the right skills and knowledge.



## Question number 14



### On-the-job training (21%)

One of the most effective ways to bridge the gap between VET learning programs and work-related tasks is through on-the-job training.

### Early career guidance (16%)

To ensure a smooth transition from VET learning programs to work-related tasks, it is vital to provide early career guidance. This can be achieved through an appropriate information strategy and practical experience.

### Trainer, coaches and teacher training (11%)

Investing in the training and professional development of trainers, coaches and teachers is crucial to improving the quality of vocational education and aligning it with work-related tasks.

### Digitization and automation contents (11%)

With technological developments reshaping industries around the world, it is imperative for vocational education to integrate the contents of digitization and automation into their curriculum.

#### Increase in job specialization (11%)

As industries become more specialized, vocational education must adapt to meet these changing needs. By offering specialized training programs that focus on specific job roles or industries, VET programs can be more effectively aligned with work-related tasks.

#### Well-regulated exchange (11%)

Facilitating well-regulated exchange between manufacturers, trade associations, educational institutions and vocational schools can significantly improve the accuracy between VET learning programs and work-related tasks.

#### Modernization of the content of vocational education (10%)

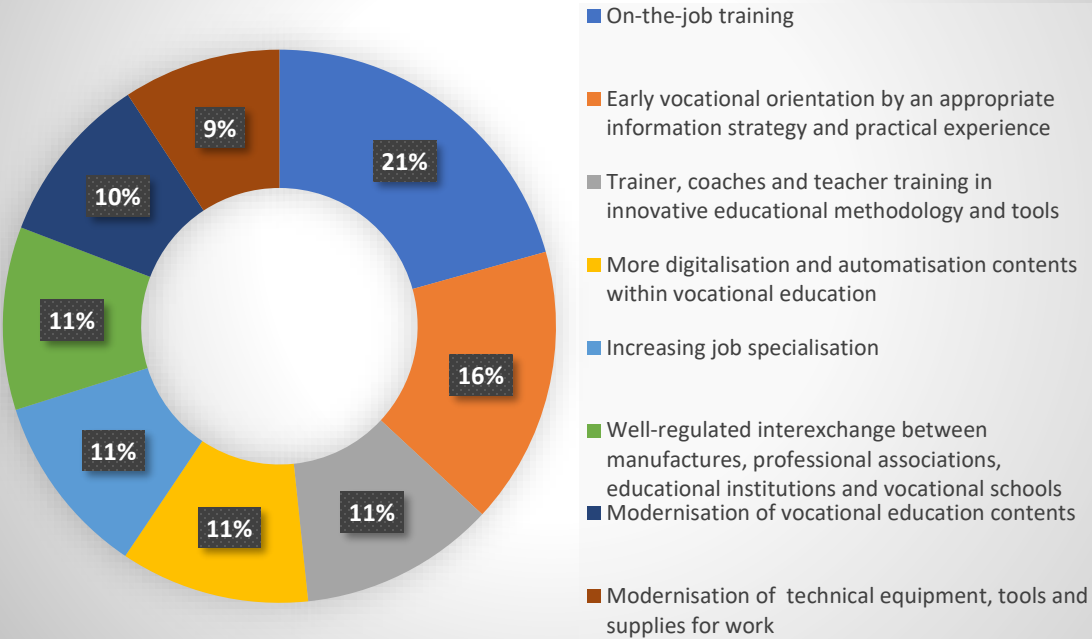
To achieve greater accuracy between VET learning programs and work-related tasks, there is a need for continuous modernization of vocational education content. This entails regularly reviewing and updating the curriculum to reflect industry trends, technological developments and emerging job roles.

#### Modernization of technical equipment and tools (9%)

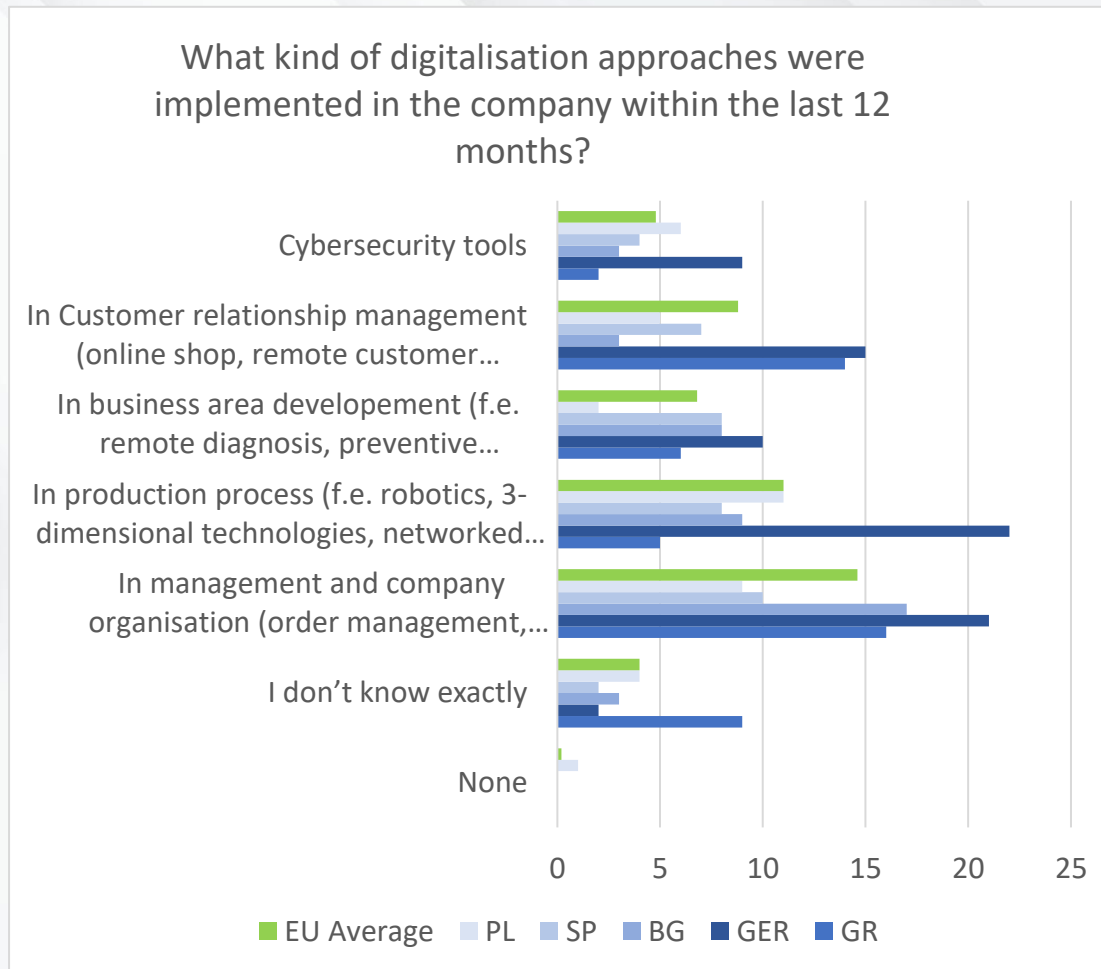
In addition to updating the content of vocational education, the modernization of technical equipment, tools and supplies is equally important. As industries incorporate new technologies, it is vital for VET programs to provide students with access to state-of-the-art tools and equipment.



## How to achieve a higher accuracy between VET learning programme and job-related tasks?



## Question number 15



Survey results: What kind of digitization approaches were implemented in companies in the last 12 months?

### Company Management and Organization (29%)

Digitization has revolutionized the way companies manage their internal processes. With effective order management, human resource management and customer management systems, companies can streamline their operations and improve efficiency. By digitizing these processes, companies can ensure seamless communication, track orders, manage employee data and provide better customer service.

### Production Process (22%)

Digitization has significantly changed the production process in companies. The introduction of robotics, 3D technologies and networked manufacturing has

revolutionized the way products are manufactured. These developments not only increase productivity but also improve product quality. By incorporating digital technologies, companies can automate repetitive tasks, reduce errors and improve overall efficiency.

#### Customer Relationship Management (18%)

Companies have realized the importance of leveraging digital technologies to improve customer relationship management. With the advent of online stores, remote customer service and social media platforms, companies can now connect with customers on a whole new level. This allows them to provide personalized service, address concerns in a timely manner and build stronger relationships with their customers.

#### Business Space Development (13%)

Digitization has also paved the way for the development of innovative business space. Companies use technologies such as remote diagnostics, preventive maintenance and IT services to remain at high levels of quality and reliability.

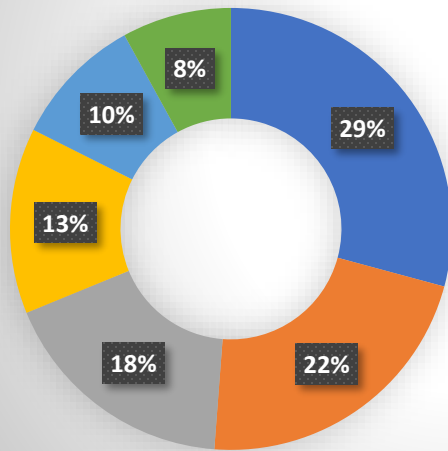
#### Cyber Security Tools (10%)

With increasing reliance on digital technologies, cyber security has become an important concern for companies. Digitization approaches now include the implementation of robust cybersecurity tools. These tools help protect sensitive data, prevent cyber-attacks, and ensure the integrity and privacy of company information. By investing in cyber security, companies can mitigate risks and build trust with their customers.

#### I don't know exactly (8%)

While digitization has become a widespread phenomenon, a small percentage of companies are still unsure of the specific approaches they have implemented. This may be due to lack of awareness or limited understanding of digitization. However, with the rapid advancement of technology, it is vital for these companies to embrace digitization to remain competitive in the market.

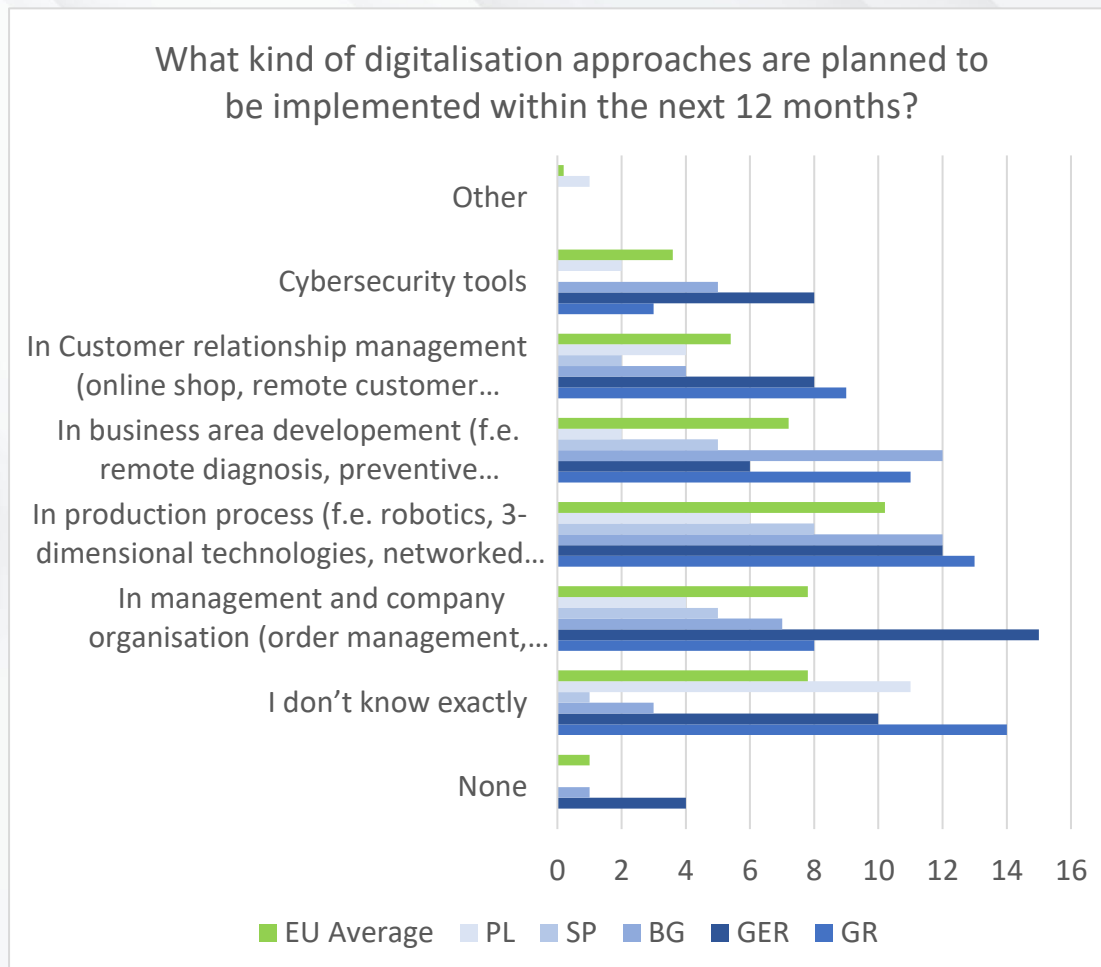
## What kind of digitalisation approaches were implemented in the company within the last 12 months?



- In management and company organisation (order management, human resources management, customer management)
- In production process (f.e. robotics, 3-dimensional technologies, networked manufacturing etc.)
- In Customer relationship management (online shop, remote customer services, social media etc.)
- In business area development (f.e. remote diagnosis, preventive maintenance, IT-services etc.)
- Cybersecurity tools
- I don't know exactly



## Question number 16



Survey results: What are the planned digitization approaches within the next 12 months?

Production Process (24%)

The production process is another important area where digitization is poised to bring about massive changes and transformations.

Order Management, HR Management and Customer Management (19%)

Digitization in company management and organization has enormous potential for streamlining operations, improving efficiency and improving customer experience.

Business Space Development (17%)

To thrive in today's dynamic business environment, companies must focus on the continuous growth of their business segments. Digitization plays a central role in achieving this goal.



### Customer Relationship Management (13%)

Digitization has already revolutionized the way companies interact with their customers. With the advent of online shopping and social networking platforms, building a strong online presence and providing remote customer service has become vital.

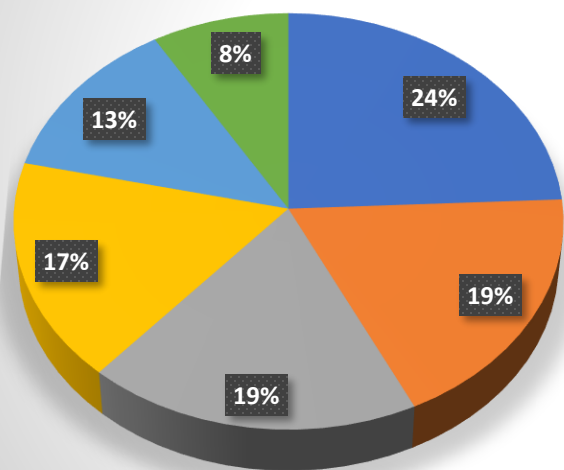
### Cyber Security Tools (8%)

As businesses increasingly rely on digital technologies, ensuring strong cyber security measures are of utmost importance. Cyber threats are constantly evolving, and companies need to be proactive in protecting their digital assets.

### I don't know exactly (19%)

While the survey results demonstrate a clear intention among companies to embrace digitalization, a significant percentage (19%) remain uncertain about the exact approaches they plan to implement.

## What kind of digitalisation approaches are planned to be implemented within the next 12 months?



- In production process (f.e. robotics, 3-dimensional technologies, networked manufacturing etc.)
- I don't know exactly
- In management and company organisation (order management, human resources management, customer management)
- In business area development (f.e. remote diagnosis, preventive maintenance, IT-services etc.)
- In Customer relationship management (online shop, remote customer services, social media etc.)
- Cybersecurity tools

### 3.4 Evaluation of the feedback:

The FactCheck survey delves into the heart of the metal industry, offering a comprehensive analysis of its workforce, skills landscape, and emerging trends. This evaluation dives deeper into the key findings, uncovering valuable insights for industry stakeholders and policymakers.

The survey underscores the vital role of Vocational Education and Training (VET) programs, with the majority of respondents having received vocational training. This reinforces the value of equipping individuals with job-specific skills, aligning with the high demand for "machine and system operators" who manage crucial production

equipment. Moreover, the focus on "additional professional skills" reveals a workforce actively seeking continuous learning and development, highlighting the need for flexible and adaptable skills training programs.

The survey paints a clear picture of the industry's embrace of Industry 4.0 technologies. The dominance of robotics, CNC machines, CAD design, 3D printing, and CAM as "most important" future skills indicates a shift towards automation and digitalization. This trend aligns with the finding that digitization has primarily impacted "company management and organization," followed by production processes. It is crucial for companies to invest in upskilling and reskilling their workforce to bridge the gap between traditional skillsets and these emerging technologies.

One of the survey's most crucial findings concerns the disconnect between VET programs and work-related tasks. The emphasis on "on-the-job training" and "early professional orientation" suggests a need for closer collaboration between industry and educational institutions. This could involve incorporating real-world projects into VET programs, fostering stronger partnerships between manufacturers and schools, and ensuring trainers possess relevant industry expertise.

The survey also sheds light on the challenges faced by the industry in attracting and retaining talent. "Inappropriate professional qualifications," "low individual competence," and "low work readiness" stand out as major hurdles. Addressing these issues requires a multi-pronged approach, including improved career guidance, targeted skills development programs, and promoting the attractiveness of metal industry careers to younger generations.

In conclusion, the FactCheck survey serves as a valuable roadmap for the metal industry's future. By prioritizing VET programs, fostering continuous learning, embracing Industry 4.0 technologies, and bridging the gap between education and work, the industry can ensure a skilled and adaptable workforce capable of navigating the ever-evolving landscape. Addressing workforce challenges and remaining vigilant in the face of digitization are crucial for the industry's success in the years to come.

#### **4. Outcome: Formulation of training concept with possible trends and developments**

Formulating training concepts for the metal industry requires a deep understanding of industry trends and skill requirements.

The FactCheck project, after collecting and analyzing survey data conducted among metal industry professionals, aims to highlight these characteristics in order to create



renewed training concepts. These training concepts should consider the new trends and developments that dominate the metal industry sector.

Listed below are some of the characteristics highlighted by workers in the metal industry that should be considered in education and training programs and the creation of training tools.

Continuous learning and skill development are essential for workers to remain competitive and adapt to new technologies.

It is important to consider the specific needs and skill requirements of industry professionals, from learning the latest welding techniques to understanding advanced processes and procedures.

A set of training methods such as practical on-the-job training, training seminars or online courses are necessary for employees to remain competitive in the industry and adapt to new challenges and technologies.

By incorporating new technologies and trends such as digital transformation, robotics and automation into training programs, employees can update their skills to meet the challenges created in their work environment.

In addition to technical skills, soft skills such as communication, leadership and problem solving are becoming increasingly important in today's workforce. Therefore, training programs should place greater emphasis on the development of these skills.

Through training and information on the latest trends in the industry and the labor market, opportunities are created for employees for professional development, but also for companies in the industry for staffing with highly qualified personnel.

One of the most important aspects of formulating a training concept is ensuring that it is flexible enough to adapt to the ever-changing needs of the workforce.

Flexible training programs allow employees to learn at their own pace and in a way that is closer to their individual learning styles, which enhances the effectiveness of the training program.

One of the key trends in educational programs is the integration of digital tools and platforms. Through online learning modules and virtual reality simulations, technology has revolutionized the way employees are trained. By incorporating technology into training programs, companies can provide a more engaging and interactive learning experience for their employees, leading to better knowledge retention and improved skill development.

As part of the Factcheck project, an online space, JODALab, was designed and implemented, where all interested parties can find useful material related to education and training.



A range of free online video and multimedia courses covering technical skills in the fields of electrical and metal industry as well as soft skills are available to the public.

The aim is for the site's material to be updated and enriched over time, so that it constitutes a useful educational tool both for employees and for vocational education and training providers.

## 5. Summary and Recommendations

Using the results of the European project FactCheck survey, interested parties can derive useful information and draw conclusions about the current situation in the metal industry regarding VET (Vocational Education and Training), skills and specific occupational tasks.

Understanding the training needs of workers, identifying the necessary skills, identifying the most sought-after professional profiles and the impact of digitization and new technologies required by Industry 4.0 in the sector is considered imperative in order to draw up policies, to produce up-to-date training plans and training and teaching tools.

Vocational Education and Training (VET) centers play a crucial role in equipping individuals with the necessary skills and knowledge required to succeed in various industries.

VET teachers or trainers, it is important to stay up to date with the latest trends, techniques, and advancements in vocational education. By doing so, can enhance the learning experience for their students and ensure that they are well-prepared for the job market.

In summary, VET teachers and trainers need to possess in-depth knowledge about their subjects, be proficient in delivering effective instruction, and be familiar with the industry requirements. They should also have the ability to engage and motivate their students, catering to their individual needs and learning styles.

### **Recommendations:**

**Continuous Professional Development:** As a VET teacher or trainer, it is essential to engage in continuous professional development opportunities. Attend workshops, conferences, and seminars related to vocational education to stay updated on the latest teaching methods, technology, and industry practices.

**Industry Partnerships:** Establish partnerships and collaborations with industries relevant to the vocational courses being taught. This will enable trainers to incorporate real-world scenarios and provide students with practical experiences, making their learning more relevant and valuable.

**Use Technology:** Embrace technology to enhance the learning experience. Utilize online platforms, educational software, and interactive tools to make lessons more engaging and interactive for students. Incorporate multimedia elements such as videos and simulations to make complex concepts easier to understand.

**Personalized Learning:** Recognize that each student has unique strengths, weaknesses, and learning styles. Create a student-centered approach by tailoring instructional methods and assessments to meet individual needs. Provide opportunities for students to set goals and track their progress, fostering a sense of ownership and motivation.

**Collaborative Learning:** Encourage collaborative learning among students. Group projects, discussions, and peer-to-peer feedback can promote teamwork, problem-solving skills, and critical thinking. Provide opportunities for students to share their knowledge and expertise with one another.

**Inclusive Practices:** Create an inclusive learning environment that accommodates students with diverse backgrounds, abilities, and learning needs. Use inclusive teaching strategies and materials, and provide additional support and resources as required.

**Partnerships with Other Educators:** Collaboration with other VET teachers and trainers is important for professional growth. Exchange ideas, share resources, and discuss best practices to enhance the quality of vocational education.

**Regular Evaluation:** Regularly evaluate the effectiveness of teaching methods, course content, and assessments. Collect feedback from students, industry professionals, and other stakeholders to identify areas of improvement and make necessary adjustments.





# Factcheck

Adapting quality of VET offer to the need of industry – manufacturing sector

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