Interreg CENTRAL EUROPE

Co-funded by the European Union

DiSTT

Digital Fabrication Skills Landscape Report

D 1.1.1

Comprehensive Report on selected Labour Markets in Central Europe

DiSTT - Digital Skills Transformation Toolkit for a Resilient Labour Market, CE0200661

10|2024



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Disclaimer

This publication has been developed within the Digital Skills Transformation Toolkit for a Resilient Labour Market (DiSTT), Project ID CE0200661, supported by the Interreg CENTRAL EUROPE Programme with co-financing from the European Union. Its content is the sole responsibility of the authors and the project partnership and does not necessarily reflect the views or positions of the Interreg CENTRAL EUROPE Programme, its programme bodies or the European Union. Neither the programme authorities nor the European Union can be held responsible for any use that may be made of the information contained herein.

A. Introduction

About digital manufacturing skills

Digital manufacturing skills we understand as a specialized subset within the broader domain of digital skills, focusing specifically on the technologies and techniques used to integrate digital tools and processes into manufacturing. These skills involve knowledge in areas such as computer-aided design (CAD), computer-aided manufacturing (CAM), additive manufacturing (3D printing), robotics, and industrial IoT (Internet of Things), electronics and others.

In the wider digital skill domain, which includes skills like basic digital literacy, data analysis, cybersecurity, and software development, digital manufacturing skills sit at the intersection of digital proficiency and technical manufacturing expertise. They are important, for example, for the development of entrepreneurship in the digital era and are increasingly affecting traditional crafts that were previously unaffected by digitalization. They are key, for example, for the implementation of the principles of Industry 4.0, which emphasizes the use of smart technologies to automate, monitor and optimize production processes.

In summary, while digital manufacturing skills share foundational elements with broader digital competencies, they are uniquely tailored to transforming traditional manufacturing processes into connected, intelligent systems, positioning them as a bridge between conventional production and advanced digital operations.

Scope of the report

This report provides an analysis of the labour market ecosystems within the regions represented by the project consortium, reflecting the perspectives and influence of each individual partner. It aims to specify, validate, or adjust the assumptions outlined in the DiSTT project application. The purpose of the report is to inform and guide subsequent project activities, based on insights gathered from consultations and questionnaires with relevant stakeholders. This will provide a robust information base needed to take the next steps towards designing RE/UP programs.

Methodology and data sources

The research design is based on a mixed-methods approach that combines both qualitative and quantitative data collection techniques. This framework enables a multidimensional understanding of the labour market ecosystems and aligns with the objectives set out in the DiSTT project application.

Data collection employed a combination of surveys, interviews, and desk analysis to provide a comprehensive view of the labour market ecosystems. Structured questionnaires were distributed to stakeholders across the regions to capture quantitative data on key local labour market indicators, while interviews provided qualitative insights that added context to these findings. Additionally, desk analysis of relevant reports and publications was conducted to supplement primary data and confirm observed trends.

Report Limitations

While the methodology is intended to be comprehensive, there were some limitations, such as variability in responses across regions or limited access to up-to-date data in specific areas. Other limitations may arise from the perspective of individual project partners and their predetermined orientation to specific areas or target groups, which, while necessary for the project, may hinder the general applicability of the conclusions.

B. Key trends and opportunities in regional labour market

1. Czech Republic (LP1 BUT and PP2 FabLab Brno)

Since Czech Republic has maintained stable employment rates in 2022 (general unemployment rate of 2.2%), the country is currently dealing with general unemployment growing to the 2,8%, which is a good result compared to the EU27 result of 5,8% (source Eurostat through UPCR Brno). In less industrialized regions unemployment grows to the 8,6% (city Most), on the opposite side capital Prague has less unemployment around 1,6%.

The workforce is predominantly composed of employees, although entrepreneurs make up a significant proportion in sectors such as real estate, construction, and agriculture. Education plays a crucial role in employment stability, as higher education correlates with lower unemployment rates. While secondary education remains the most common level among workers, individuals with basic education face higher unemployment risks, underscoring the value of educational attainment in the labour market. Approximately 15% of all job vacancies in South Moravia are related to digital manufacturing technologies. These positions include CNC machine operators, 3D printing specialists, and experts in robotics and automation. The growing demand is for qualified workers who can integrate these technologies into existing production processes (Digital Skills and Jobs Platform) (Prague Forum).

1.1. Key Trend in the Czech region (LP1, PP2).

The Czech Republic has an ambitious strategy for the Digital Decade 2030, which includes improving digital skills, supporting digital transformation in businesses, and enhancing digital infrastructure. Key initiatives involve revising the ICT curriculum in schools, promoting digital skills among the public, and increasing the number of ICT professionals. The RIS JMK supports digitalization as one of the main pillars of the region's economic development (Digital Skills and Jobs Platform) (Prague Forum).

In South Moravia, employers in the manufacturing sector are seeking workers with skills in digital manufacturing technologies such as CNC machine operation, 3D printing, and robotics. However, many struggle to find qualified candidates due to skill shortages rather than high salary expectations. The demand for these skilled workers is expected to rise over the next five years, as digital transformation continues to drive manufacturing processes.

The workforce in digital manufacturing is predominantly male, but employers are recognizing the need to increase gender diversity by attracting more women into technical roles. The current workforce is aging, and companies are concerned about the lack of a smooth generational transition, making the recruitment of younger talent essential. Digitization of production processes could help make these roles more attractive to younger workers and reduce operational costs.

Some employers are also considering subcontracting or offering part-time work to address labour shortages, which could create opportunities for entrepreneurs and small businesses to fill gaps in the market while providing flexibility to companies.

2. Austria (PP3 HappyLab)

Austria has maintained relatively stable employment rates recently, with a national unemployment rate of approximately 5.1% as of 2023 (source: Statistik Austria). This figure compares favourably to the EU average, reflecting the country's robust economy and diverse job market. Vienna, the capital of Austria, has maintained relatively stable employment rates in recent years. As of 2023, the unemployment rate in Vienna was around 9.6%, which is higher than the national average. The city's diverse economy, with strong sectors in services, technology, and tourism, contributes to its resilience in the job market. In Vienna, approximately 14% of all job vacancies are related to the digital and tech sectors.

2.1. Key Trends in the Vienna region

Vienna's labour market is experiencing significant shifts driven by technological advancements, digitalisation, and the rise of the knowledge economy. Key trends include an increasing demand for digital skills and continuous professional development, as well as the integration of innovation into traditional industries, including craftsmanship. There is a growing focus on lifelong learning and upskilling to adapt to rapid technological changes. Vienna is positioning itself as a hub for innovation and entrepreneurship, supporting startups and open innovation practices. The city is also addressing labour market mismatches, particularly for marginalized groups like older workers, migrants, and low-skilled individuals. Additionally, the nationwide "Digital Competence Offensive" program aims to improve basic digital skills for the general population and strengthen IT skills for the economic sector.

3. Germany (PP4 brigk)

The labour market in Ingolstadt, Region 10 (Ingolstadt and its surrounding districts), and Upper Bavaria is experiencing significant changes driven by the digital transformation and shifts within the automotive industry. Currently, the region is characterized by a strong industrial base, particularly through Audi, which employs over 90.000 people worldwide, with around 42.000 based in Ingolstadt alone. In addition, approximately 84.000 jobs are indirectly dependent on Audi. Small and medium-sized enterprises (SMEs) are particularly affected, making up about 60-70% of Audi's supply chain. These SMEs are primarily involved in specialized manufacturing, logistics, and IT services. In addition, SMEs not connected to the automotive sector are also influenced.

The region's unemployment rate stood at approximately 2.5% in 2023, highlighting its economic stability compared to the national rate of 6.0%.

3.1. Key Trend in the Ingolstadt and Upper Bavaria

As the region moves forward, the demand for digital skills, especially in digital manufacturing, is expected to increase substantially. McKinsey predicts that the implementation of Industry 4.0 technologies could reduce production costs by up to 3.5% and increase efficiency by up to 20%. The digital transformation will have a profound impact on SMEs in the region due to its dependencies, as they face greater challenges in adopting new technologies due to limited financial and human resources. However, those that successfully integrate digital manufacturing technologies can expect to see significant benefits, including improved

operational efficiency, reduced production costs, and enhanced product customization. There will be growing need for digital competencies in production, such as operating digital machinery, CAD/CAM software proficiency, and data-driven process optimization. Also, artificial intelligence and the proper use will grow in importance. These skills are critical for adapting to the challenges posed by digital transformation and maintaining competitiveness in the global market. The challenge for SMEs will thus be to invest in new technologies and upskill their workforce to remain competitive. Public support and collaborative initiatives, such as those offered by local innovation hubs and digital centers, will be crucial in helping SMEs navigate this transition.

4. Italy (PP5 NOI Techpark)

Employment In South Tyrol, although there are some excellent large international companies, the region's economy is strongly characterized by small and medium-sized enterprises (SMEs), particularly in traditional sectors such as agriculture, handicrafts and tourism. This type of labour market must therefore also be encouraged to remain competitive and is therefore evolving with a significant focus on skills development and digital transformation, with an increasing number of companies adopting Industry 4.0 technologies, especially in advanced manufacturing and IT services. Many companies report having difficulty finding employees with advanced digital skills, indicating a pressing need for upgrading in areas such as robotics, automation and data science. In addition, language skills are essential due to the multilingual nature of the region and the central position in the “DACHI” region (Germany, Austria, Switzerland and Italy), with many companies looking for employees who are proficient in German and Italian. Although the unemployment rate remains low, disparities in youth and gender employment persist, with initiatives aimed at filling these gaps through targeted education and training programmes.

4.1. Key Trends in South Tyrol

Although the region is among those with the highest GDP in Europe, the percentage invested in research and development has not lived up to its ambitions for years. This is mainly because large public investments alone were not sufficient if not accompanied by investments and projects from the private sector. For this reason, in the last ten years, there has been a dynamic shift towards innovation and digital transformation, with a particular emphasis on developing skills in high-demand areas such as digital competencies, automation, and the green sector. The adoption of Industry 4.0 technologies is a key focus, with numerous initiatives aimed at equipping the workforce with essential digital skills, including the integration of automation and the use of advanced tools in their production processes. At the center of these initiatives is NOI Techpark, the large innovation hub established in 2017 with international ambitions, which aims to unite all research and economic actors in the region to work together.

In fact, it is essential that large local companies – global leaders in their fields – have the infrastructure and support they need to stay competitive; but above all, small and medium-sized enterprises (SMEs), which make up the majority of businesses (about 90% employing fewer than 10 workers) in the region and are mostly traditional businesses, must face the challenges of adopting these new technologies to remain competitive.

Therefore, efforts are underway to address the workforce's skills gaps through continuous education and training programs, with around 30% of workers expressing a need for additional training, and with ongoing public incentives – provincial and European – for R&D projects. As a demonstration of the success achieved thanks to these efforts, on October 7, 2024, South Tyrol received the "Regional Innovation Valley" recognition from the European Commission. This award acknowledges the region's efforts in strengthening its innovation ecosystem and aligning investments with EU priorities. Key focuses include cooperation between regions, reducing reliance on fossil fuels, promoting digital transformation, and improving

healthcare. Local hubs like NOI Techpark play a central role in this initiative, highlighting South Tyrol's growing importance as a center of innovation and research.

5. Croatia (PP6 FL Zagreb)

Employment: Zagreb, Croatia's capital, is becoming a hub for technological innovation and digital fabrication, driven by the adoption of Industry 4.0 technologies like 3D printing, CNC machining, and robotics. While Croatia is advancing in digital transformation, significant skills gaps remain, especially in digital fabrication and ICT, with only 3.5% of the workforce being ICT specialists, below the EU average. Local companies report difficulties in finding employees skilled in robotics programming, CNC operation, and electronics prototyping, with 50% struggling to hire qualified staff. The gender imbalance is also notable, with women representing only 12% of the ICT workforce.

5.1. Key Trends in Zagreb region

To address mentioned gaps, educational institutions in Zagreb are expanding their programs to include more digital skills training, supported by government funding through the National Plan for Digital Transformation. This initiative aims to revise ICT curricula, enhance public digital skills programs, and increase the number of ICT professionals.

Digitalization is expected to boost Zagreb's economy, potentially increasing GDP by up to 4% over the next decade. Companies are exploring flexible work arrangements, such as part-time work and subcontracting, to address workforce needs, presenting opportunities for entrepreneurs. However, addressing the aging workforce and skills gaps is crucial for sustaining growth in the digital economy.

6. Summary of Key trends in the regions:

Labour markets show stable employment with notable variations in digital and technical skill needs. Digital manufacturing skills, especially for roles in CNC operation, robotics, and automation, are increasingly in demand, particularly as Industry 4.0 technologies reshape production processes (Czech Republic, Germany, South Tyrol). Unemployment remains low overall, though significant skill mismatches persist, especially in digital fabrication, where only a small percentage of the workforce holds ICT-specialized roles (Croatia, Austria). Educational attainment strongly influences job security, with higher education levels correlating with lower unemployment rates, while those with basic education face greater risks (Czech Republic).

Workforce dynamics reveal shortages in skilled labour due to aging workforces, with some sectors struggling to attract younger talent. This is motivating companies to modernize their production processes to appeal to new workers and control operational costs (Czech Republic, Germany). Additionally, gender imbalances are notable in technical fields, but companies understand the importance of increasing diversity by recruiting more women in digital manufacturing roles (Czech Republic, Croatia). Employers are increasingly exploring flexible work options, such as subcontracting and part-time roles, to meet labour demands, creating new opportunities for smaller enterprises and entrepreneurs (South Tyrol, Croatia).

Public initiatives are critical to addressing digital skill gaps. National programs focus on upskilling, revising ICT education curricula, and increasing digital literacy (Czech Republic, Austria, Croatia). Support for digital transformation, including lifelong learning and training in advanced manufacturing and IT skills, aims to bolster the workforce’s adaptability to technological advancements (Austria, Germany, South Tyrol). Small and medium enterprises (SMEs), in particular, face challenges in accessing resources for digital transition, yet benefit from collaborative initiatives with innovation hubs (Germany, South Tyrol). These efforts,

supported by public and private sectors, aim to build resilience and adaptability in regional economies through continuous skill development and digital transformation.

C. Stakeholder description/confirmation

This chapter delves into the identification and confirmation of key stakeholders involved in the project. We will outline their roles, interests, and influence within the project framework. By clarifying these relationships, we aim to foster effective communication and align objectives, ensuring that all parties are engaged and informed throughout the project lifecycle. A stakeholder description not only identifies who is affected by the project but also helps in managing expectations and developing strategies for collaboration and support.

1. Cooperating Public authorities

The project collaborates with various public authorities to enhance labour market strategies and digital transformation initiatives. Key agencies in the Czech Republic, such as labour offices and chambers of commerce, monitor employment trends, support skills development, and facilitate industry networking for entrepreneurship and trade. Innovation hubs and research centres like JIC and INTEMAC connect academia with industry to promote digital manufacturing through training programs and advanced technology access. In Italy, the Innovation, Research, University and Museums Department of the autonomous Province of Bolzano plays a crucial role in fostering scientific, technological, and economic development, stimulating research, and strengthening connections between academia and the productive sector. In Austria, employment services focus on funding and training to improve digital competencies aligned with labour market demands, while organizations like waff emphasize upskilling and reskilling. In Germany, business support entities assist SMEs in integrating digital tools, and innovation centres promote digital technology adoption. In Croatia, government bodies play critical roles in establishing policies for digital transformation and sustainable economic growth, supporting financial and infrastructural initiatives that drive innovation.

1.1. LP1 BUT and PP2 FabLab Brno

Brno Labour Office of the Czech Republic

The Labour Office of the Czech Republic is an administrative office of the Czech Republic subordinate to the Ministry of Labour and Social Affairs, whose main activity is providing information on the labour market not only in the Czech Republic, but also in the European Union, registering job applicants and job vacancies.

LP1 and PP2 discussed with UPCR current trends in employment in the region and the possible positive impact on it, which can be later created by the project results.

Brno Regional Chamber of Commerce

Brno Regional Chamber of Commerce is an independent legal entity within the network of the Czech Chamber of Commerce supported by the South Moravian Region and the City of Brno. It works to support entrepreneurial activities and to promote and protect the interests of its members, which is over 300 companies. Chamber provides activities regarding information, consultacy, organization and education which supports trade.

LP1 will cooperate with RHK on information level about specific needs of industrial partners and possible networking and meetings with relevant industrial partners to discuss features of the future RE/UP programs.

JIC (South Moravian Innovation Centre)

JIC is a Czech interest association of legal entities that focuses on the support of innovative business and the commercial use of research and development. Mediates the connection of universities and scientific research institutions with the business sphere, with the aim of maximizing the contribution of research and development at the regional and national level

Vision of JIC is an open innovation ecosystem that is home to globally successful entrepreneurs and inspires the world.

PP2 will collaborate with JIC to enhance your project by leveraging its network to co-develop training programs that address specific skills gaps in digital fabrication. JIC can facilitate partnerships between universities and industry, providing practical, hands-on experience through their infrastructure and events. Additionally, their support in startup incubation and policy advocacy can amplify the project's impact, aligning with regional innovation strategies and fostering an ecosystem that nurtures globally competitive entrepreneurs.

INTEMAC

is a research and innovation centre located near Brno. INTEMAC is operating the testbed, where Industry 4.0 approaches and technology can be tested, introduced and experienced and encouraged to harness the state of art technologies in digitizing of manufacturing. They also provide a knowledge source about market needs and adoption of digitization as well as knowledge about the ecosystem of companies providing support in digitization, experiences with webinars about digitization.

LP1 will cooperate with INTEMAC on the topic of specification of digitization needs and to contact and choose possible partners for closer collaboration on set-up of future programs.

LP1 and PP2 will coordinate their activities to the mutual benefits to the local ecosystem of educational organizations in digitization of manufacturing. Expected subjects are: Czechitas - focuses on increasing the participation of women in IT and technology fields. DigiKoalice - promotes digital education across generations.

1.2. PP3 Happylab

City of Vienna

As the location of Happylab and an important partner in urban development.

AMS (Austrian Public Employment Service)

Supports job placement and qualification efforts.

Austrian Chamber of Labour

which represents the interests of employees and workers in Vienna. Mag. Timon Pfleger, BA, AK Wien - Social Policy Department: Arbeiterkammer Wien.

The Arbeiterkammer Wien

emphasizes the critical importance of digitalizing education and training for apprentices and craftsmen. At the moment they don't have any concrete measures regarding this topic, but the education department was especially interested in supporting the topic and connecting us with state-funded educational institutions.

The Vienna Employment Promotion Fund (waff)

is the City of Vienna's labour market organization. It helps people working in Vienna to advance in their careers. The waff (Vienna Employment Promotion Fund) is a crucial partner in this context due to its commitment to improving employability and skills development in Vienna. By providing funding, resources, and training programs, waff supports initiatives that enhance the digital competencies of the workforce. Their focus on upskilling and reskilling aligns with the goals of projects like ours, ensuring that workers are equipped with advanced digital skills necessary for the evolving job market. This collaboration helps bridge the gap between traditional training programs and the need for more specialized digital education.

1.3. PP4 brigk

To reach as many relevant companies as possible, we cooperate with our trusted stakeholders. These institutions have been accompanying our mission as a start-up incubator since our start. To get a high quality of results in our confirmation of the landscape and the survey responses we will partner up to get the relevant information and to identify suitable and willing SMEs for the program. Also the stakeholders provide as with the needed contacts.

IHK München und Oberbayern and Handwerkskammer für München und Oberbayern (HWK)

support businesses and SMEs with certifications and training, focusing on integrating digital tools into operations and production.

Bayern Innovativ GmbH

organisation for Innovation and Technology Transfer, facilitates the adoption of digital fabrication technologies, providing resources and networking opportunities.

Wirtschaftsförderung Ingolstadt and Regionalmanagement Region Ingolstadt

and their corresponding agencies in the neighboring districts promote economic growth and innovation, helping businesses adopt digital technologies.

1.4. PP5 NOI Techpark

The Innovation, Research, University and Museums Department of the autonomous Province of Bolzano

with its Innovation and Technology Office and the Scientific Research Office, plays a pivotal role in fostering the scientific, technological, and economic development of South Tyrol. This department is instrumental in stimulating and supporting research, encouraging the creation and growth of innovative new businesses, and strengthening the connection between academia and the productive sector. Through a variety of initiatives and tools, the department supports research projects, facilitates technology transfer, and promotes a culture of innovation. These efforts contribute to making South Tyrol an increasingly attractive region for investors, researchers, and talent, bolstering its competitiveness on both national and international levels.

The autonomous Province of Bolzano is not merely a partner but is, in fact, an integral part of NOI itself. NOI Techpark was born and grew thanks to their efforts, with NOI Ltd. being an in-house company owned by the province. The support for innovation provided to South Tyrolean businesses, including projects like DiSTT, is always the result of teamwork with these departments.

The Chamber of Commerce of Bolzano

is a public institution supporting local businesses. They are partners of Maker Space in other projects, not in this one, but they will certainly support us because we work together to move forward in the same direction (supporting the growth and innovation of local companies).

1.5. PP6 Zagreb

Ministry of Economy and Sustainable Development

This ministry plays a pivotal role in crafting policies and strategies for digital transformation and sustainable economic growth in Croatia. It oversees initiatives like the Smart Specialization Strategy (S3), which supports innovation and digital skills development in manufacturing and other key sectors.

Local Governments

In manufacturing hubs like Zagreb, local authorities provide support to industries through grants, infrastructure development, and collaborations with businesses and academic institutions to boost digital innovation.

2. Cooperating Industrial partners:

The project engages with various industrial partners to identify and address the digital manufacturing skills needed by employers. In the Czech Republic, interviews with representatives from small, medium, and large enterprises provide insights into the specific skills required for digital fabrication and automation. Public training institutions in Austria enhance digital competencies in vocational training, while industry leaders in Germany set standards for training programs to meet evolving demands. In Italy, associations support local businesses and connect them to the project, offering consulting and educational services to SMEs. Innovators in Croatia contribute to enhancing skills and driving industry innovation through advanced manufacturing techniques.

2.1. LP1 BUT and PP2 FabLab Brno

We have asked several companies as representatives to help us understand the demands placed on employees by employers in terms of digital manufacturing/fabrication skills. We conducted interviews with these representatives based on the Survey for industrial partners questionnaire.

- Small/Micro Enterprises: 3Dees, GMP Europe, Beam sign, Lukmatic
- Medium Enterprises: One3D, ASIO, MSR Engines, PBS
- Large Enterprises: Honeywell Brno, Škoda Auto

3Dees Industries: 3Dees Industries drives 3D printing and scanning innovation across the Czech Republic and Slovakia. With expertise in additive technologies, they transform traditional manufacturing, providing practical, advanced solutions and professional education to accelerate industrial development. (LP1 BUT)

Lukmatic: Small company which brings valuable expertise in 3D modeling, printing, reverse engineering, and custom fixture design to the project, enhancing innovation with a personalized approach for each client and solution. (LP1 BUT)

One3D: is a leading Czech company in additive manufacturing and post-processing for plastic and metal components, advancing innovation within the automotive, engineering, defense, and space sectors across Central and Eastern Europe. They aim to become a recognized authority in additive technologies, balancing industrial progress with environmental and social responsibility. (LP1 BUT)

MSR Engines: specializes in developing and manufacturing motorized surfboards, electric skateboards, and drone propulsion systems. Their primary focus is on motorized surfboards, where they have led the market for over a decade under the JETSURF® brand. Recently, they have expanded into electric skateboards and aerial engines, broadening their impact in innovative recreational and propulsion technology. (LP1 BUT)

PBS: is a holding-based joint-stock company that manages investments and shareholder rights for engineering companies within its group. Its primary mission is to foster the long-term growth of these companies, creating synergies to deliver comprehensive product solutions across various industrial sectors. The products and services of PBS GROUP's companies are in demand globally, particularly in the aerospace, energy, and transportation industries. (LP1 BUT)

Y Soft Corporation: A Brno-based technology company specializing in enterprise office solutions, including 3D printing solutions. They can offer practical insights and potential collaborations for training programs. (PP2 FL Brno)

Honeywell Brno: A significant player in the automation and control solutions market, which could provide industry-specific knowledge and support for training in digital manufacturing. Industry experts from Honeywell could lead workshops or guest lectures on the latest trends in automation and digital manufacturing. (PP2 FL Brno, LP1 BUT)

By partnering with these industrial companies, the DiSTT project can enhance the practical aspects of its training programs, ensuring they are aligned with the needs of modern manufacturing. These companies can provide not only practical experience but also insights into the skills required for digital transformation, thereby improving the employability of trainees and fostering innovation in the region.

2.2. PP3 Happylab

Wiener Linien GmbH & Co KG, Christian Koch, F51LA | Lead Trainer ETM Lehre bei den Wiener Linien

Wiener Linien is one of the largest public training institutions in Vienna, annually training 480 apprentices in various fields. Since 2024, a new regulation from the Federal Minister of Labour and Economy has emphasized the importance of digital competencies within vocational training. It is now the responsibility of training companies to cover these competencies as part of their apprenticeship programs. Our cooperation with this municipal training institution allows us to gain a diverse and in-depth insight into the need for digital skills in vocational training through our future surveys. Likewise with the cooperation with Jugend am Werk, this partnership offers an opportunity to pilot our initiatives with a company that could benefit from Happylab's offerings in the future.

2.3. PP4 brigk

Audi AG: is the region's largest employer, setting the standards for digital skills, particularly in automotive manufacturing.

Airbus, Continental, Bauer AG: and others are also major players, contributing to the demand for advanced manufacturing and digital skills.

As industry leaders these companies can provide information on what will be the needs of tomorrow. We will invite them to have the opportunity to shape the future on the base and have influence on their suppliers through the project.

2.4. PP5 NOI

There are two major associations with which we will collaborate on this project:

Wirtschaftsverband für Handwerker und Dienstleister (lvh.apa): is the biggest economic association for craftsmen and service providers in South Tyrol, with ca. 8.000 members. They support artisan businesses with various services, including tax, legal, financial consulting, continuing education, innovation, marketing, and internationalization. They are partners of Maker Space since the beginning - they also have a branch office at NOI dealing with 'Innovation and new markets' - and are also local partners in DiSTT project.

Südtiroler Handwerksverband (SHV): They are similar to lvh.apa, but mainly targets local 'Italian' companies. They have a smaller number of members but together with lvh they help us reach many companies.

South Tyrol also boasts a strong presence of organizations such as Unternehmerverband Südtirol, the voice of industries, HGV, dedicated to the hospitality industry, Südtiroler Bauernbund representing farmers, Confesercenti focusing on commerce and services. These associations play a crucial role in their respective sectors, providing support, representation, and shaping the regional economic landscape. However, they are not central to the project's objectives, which focus primarily on sectors where digital production can truly make a difference, aiming to have a primary impact on small and medium-sized enterprises.

2.5. PP6 Zagreb

Končar and Ericsson Nikola Tesla: Two major Croatian companies leading digital transformation in manufacturing. Končar focuses on automation and smart technologies for industrial applications, while Ericsson Nikola Tesla drives innovation in telecommunications and AI for industrial use.

Rimac Automobili: A startup that has grown into a globally recognized innovator in electric vehicles and advanced manufacturing technologies. Rimac's focus on digital production methods exempli.

3. Involved Academia (science), Educational Institutions and Training Centers

The project involves academic institutions to improve digital skills in manufacturing. The lead partner, Brno University of Technology (LP1), facilitates collaboration and data support among departments, while another partner (PP2) offers additive manufacturing courses to align with youth interests. Cooperation with vocational and technical schools (PP2) helps implement tailored educational programs for students. Public educational institutions in Austria emphasize digital competences in apprenticeships, aligning with new training regulations. Various universities and research institutions in Germany and Italy focus on digital transformation and business innovation, providing specialized training. In Croatia, the University of Zagreb collaborates with industries to support research and development in robotics and AI.

3.1. LP1 BUT and PP2 FabLab Brno

Brno University of Technology (BUT)

BUT itself, as lead partner and stakeholder at same time, will provide data and knowledge source and cooperation between departments. Communication and involvement of other universities is not excluded, but it is less likely.

Aditimi

Additive manufacturing courses for public, industry and freelancers. The company performs influencer marketing and content making, especially in the field of 3D printing. Its target group is high school and university students. Aditimi has knowledge and their own research on the trends that interest young people. Thanks to the cooperation with Aditimi, LP1 will be able to better understand what the interest of our target group is, or how this interest develops over time.

Czechitas

Czechitas is a non-profit focused on increasing women's participation in IT and digital skills. Cooperation with Czechitas to create digital fabrication workshops specifically for women, teaching them to use 3D printers, CNC machines, and other manufacturing technologies. Jointly organize events like hackathons to offer hands-on experience and encourage innovation in digital fabrication among women, helping to reduce the gender gap in this field.

High Schools

PP2 will also cooperate with vocational and Technical High Schools in South Moravia: Schools that specialize in engineering, technology, and IT fields can be important partners for reaching the target group of high school students. Collaborating with these institutions can help in implementing training programs directly within the education system or filling the gap that education system cannot easily fill.

3.2. PP3 HappyLab

Jugend am Werk

Désirée Müller, Digitization Center| Head of digital project team Jugend am Werkhttps

Since 2021, Jugend am Werk has had a dedicated department for digital competencies. All apprentices need to receive training to enhance their digital skills. The AMS in Vienna, which funds the training at Jugend am Werk, has even mandated in the new training regulations that apprentices must learn digital competencies. Additionally, this partnership offers an opportunity to pilot our initiatives with a company that could benefit from Happylab's offerings in the future.

3.3. PP4 brigk

Technische Hochschule Ingolstadt (THI) have specialized trainings in digital manufacturing and CAD/CAM within their provided studies.

Katholische Universität Eichstätt-Ingolstadt (KU Eichstätt) complements this with programs in digital transformation and business innovation.

3.4. PP5 NOI

At the NOI Techpark, all major players in research and education in South Tyrol are present, with a focus on project-related topics. They will be strategic allies in the construction phase of DiSTT's training offer:

Eurac Research

is a private research center Founded in 1992, it focuses on addressing regional challenges through interdisciplinary research. Its areas of expertise include climate change, resource management, biodiversity, personalized medicine, and social integration but also green technologies, IoT and Sensors. Notable labs in NOI include the terraXcube for climate simulations and the Center for Sensing Solutions, focus on censoring systems.

Fraunhofer Italia

is a non-profit research institute established in Bolzano in 2009. It's part of the Fraunhofer-Gesellschaft, a leading European applied research organization. Fraunhofer Italia focuses on digitalization and sustainability, providing services like concept development, feasibility studies, and engineering solutions. Its research areas include advanced robotics, flexible production systems, building information management, and human-centered technology. Fraunhofer Italia's ARENA - Area for Research and Innovative Applications is a hub for collaboration where researchers work alongside public and private stakeholders to apply innovative solutions to real-world problems

Free University of Bolzano

The Free University of Bolzano offers various engineering programs with a focus on digital and innovative technologies. These include: Bachelor's Degrees in Industrial and Mechanical Engineering, Computer and Automation Engineering; Master's Degrees in Mechatronics Engineering and Software Engineering for Industrial System; Doctoral Programs in engineering fields; They can rely on state-of-the-art infrastructure

and labouratories such as Field Robotics Lab (FIRST Lab) – Develops and tests robotics and technologies for monitoring and automation in challenging environments like slopes, rivers, lakes, and snow; Human-Centred Technologies and Machine Intelligence Lab – Researches artificial intelligence with a focus on ethical and innovative solutions; Sensor System Technologies Lab – Develops solutions for data collection through fast, autonomous, and affordable sensors (with EURAC); Smart Data Factory – Specializes in the collection, processing, and smart analysis of large, complex datasets and Smart Mini Factory – Aims to enhance Industry 4.0 practices, focusing on smart manufacturing and automation.

The new engineering faculty inaugurated in September 2024 at the NOI Techpark undoubtedly represents one of the crucial moments in the development of Alto Adige in the field of education.

Deutsche Bildungsdirektion Südtirol

Provincial Directorate for German-language education in South Tyrol manage German-language education from early childhood to vocational training, offering Courses for artisans and commercial operators, including "Meister" and "Handelsfachwirt." The primary goal is to provide advanced professional qualifications in the crafts and hospitality sectors through the "Master Professional" diploma and in commerce through the "Commercial Technician" diploma. These qualifications are designed to prepare individuals for leadership roles or entrepreneurial endeavors in their respective fields. They collaborate with Maker Space on many projects, including an ‘innovation’ module offered at NOI during the Master Professional course. The location of the Master Professional is at NOI Techpark. They are a local partner in this project and are very interested in understanding which courses to offer to grow their training proposal in an innovative way

3.5. PP6 Zagreb

University of Zagreb: Particularly its Faculty of Mechanical Engineering and Faculty of Electrical Engineering and Computing (FER), collaborates with industries to provide digital skills training and R&D support in areas like robotics and AI. Projects like CROBOHUB focus on advancing robotics and digital innovation.

4. Involved Citizens/Society

For the purposes of the project, by involved citizens we mean the target groups of individual partners, whether it is a person individually or within a group, for example a company.

This includes university students lacking up-to-date skills, young people entering the labour market, and craftsmen who need digital fabrication skills. Additionally, the project targets SMEs undergoing major industry changes, as well as SMEs, micro-enterprises, and artisans located in geographically disadvantaged areas. Less privileged citizens in rural regions are also a focus, all of whom require tailored support to address skill gaps, adapt to technological advancements, and improve access to resources for greater economic participation.

The project targets various citizen groups, including university students, young job seekers, craftsmen, SMEs, and individuals in rural areas needing digital fabrication skills. The lead partner (LP1) focuses on engaging high school and university students in STEM fields, while another partner (PP2) gathers feedback from students and SMEs to shape relevant courses. In Vienna (PP3), current students, working professionals, and job seekers are targeted for reskilling and employability through digital manufacturing skills. A partner in Bavaria (PP4) emphasizes STEM education initiatives for SMEs and their employees. Another partner (PP5) promotes participation from companies and the general public in a technology park setting. In Zagreb (PP6),

programs address demographic challenges by providing digital skills training for both young and older citizens, enhancing employability and digital economy participation.

Below we provide a more detailed description from the point of view of individual project partners.

4.1. LP1 BUT

Target group of the lead partner are both students of High Schools with a positive attitude to the future university studies and current students who are already studying at BUT and can use the strojLAB during their studies, whether it is for private projects, regular classes, or final theses.

Optimal profile of such a person is a positive attitude toward STEM fields and digital fabrication is driven by curiosity and a passion for problem-solving. They enjoy breaking down complex challenges and applying scientific principles creatively. Academically strong in STEM subjects, they often participate in competitions and hands-on projects, with a keen interest in mechanical engineering and various other engineering fields using interdisciplinary approaches

The primary focus is on students of mechanical engineering design and industrial design at both the bachelor's and master's level. These students are the most frequent potential users of strojLAB facilities where digital fabrication technologies are available. We plan to focus more on high school students, whom we address in the form of field lectures, where we present the forms of study and the ways in which digital fabrication is implemented in teaching and student projects.

Beyond the scope of the target group, we address the general public at events such as Night of Scientists, where we strive to stimulate motivation and enthusiasm for STEM fields. For example, we collaborate with PRUSA Research on their educational program for primary school teachers.

4.2. PP2 FabLab Brno

FabLab Brno can leverage its extensive experience offering public courses and workshops, drawing on the knowledge and feedback from university students, young professionals, craftsmen, and SMEs to shape the high school program. The input from these groups will help identify relevant skills and industry needs. Additionally, FabLab has a network of mentors from previous collaborations who can provide valuable expertise and guidance in developing the curriculum, ensuring the program is practical and aligned with market demands.

4.3. PP3 HappyLab

In the Vienna region, we have identified several key stakeholder groups within the board society as potential beneficiaries of our program. Current Students: 1. Opportunity for further education. 2. Preparation for future job market demands. Working Professionals: 1. Employees seeking reskilling opportunities. 2. Individuals interested in upskilling within their field and also Job Seekers: 1. Access to qualification measures. 2. Enhanced employability through digital manufacturing skills.

This diverse range of target groups reflects the broad applicability and potential impact of our program within the general society of Vienna.

4.4. PP4 brigk

Target group of Region 10 and upper Bavaria for the re-/up-skilling are SMEs and their employees. Beside this group of citizens, the resulting program can have an influence on a broad public as it reflects the needs

of the future. It might be a useful addition to existing programs for education for young people in the STEM-related field.

4.5. PP5 NOI

Our target audience will mainly be companies and their employees, but it will not be a 'hard' barrier. We will try to make the objectives of the programme clear, but once this is done we will leave it open to anyone interested in participating.

This applies especially to the first pilot part, where the target will be narrower on companies. Subsequently, the offer can be broadened and adapted to maximize the impact on society. The NOI Techpark is in fact a public technology park, a city district with activities for children and all citizens.

4.6. PP6 FL Zagreb

With an aging population and high youth unemployment, citizens are targeted through programs like Digital Skills for All Ages, which provides reskilling opportunities for both young and older workers. These initiatives aim to boost employability and participation in the digital economy.

Zagreb is a central manufacturing hub, hosting numerous startups, large enterprises, and academic institutions focused on manufacturing innovation. Efforts are geared towards leveraging digital technologies to enhance productivity and competitiveness.

D. Target group description - Challenges in Manufacturing Skills

The project targets various groups facing challenges in manufacturing skills. LP1 (Brno University of Technology) focuses on university students (ages 19-26) in mechanical and industrial design, particularly engaging younger high school students through a new bachelor's program that serves approximately 50,000 secondary school students in the South Moravian region. PP2 (FabLab Brno) targets young individuals aged 15-19 transitioning from general education to the workforce, addressing their lack of technical skills and exposure to digital fabrication technologies while equipping them with essential technical and soft skills to enhance employability. PP3 (HappyLab) focuses on apprentices from vocational training institutions in Vienna, integrating digital competencies into traditional training to address skill mismatches and promote inclusivity for marginalized groups, in alignment with Vienna's strategy for innovation and digital literacy. PP4 (brigk) works with Small and Medium-Sized Enterprises (SMEs) in Region 10, essential to the local economy, which face significant challenges in adopting new technologies, as many employees lack the necessary digital fabrication skills for modern production. PP5 (NOI Techpark) aims at small to medium-sized enterprises and artisan businesses in South Tyrol, helping them navigate challenges posed by size and location during digital transformation, and fostering a blend of traditional manufacturing skills with digital competencies to enhance market competitiveness. Lastly, PP6 (Zagreb) includes children with disabilities from organizations like the Center for Upbringing and Education Slava Raškaj, addressing their unique challenges in acquiring digital skills, as well as focusing on vulnerable children and those in rural areas by promoting tailored training programs and early exposure to digital manufacturing tools for future career opportunities.

Selected TARGET GROUPS in the project proposal (C.2.2)

- LP1 university students (19-26 y/o) lacking up-to date skills
- PP2 young people (15-19 y/o) entering labour market
- PP3 craftsmen lacking digital fabrication skills
- PP4 SMEs undergoing major industry change
- PP5 SMEs, micro enterprises and artisans and located in geographically disadvantaged area
- PP6 less privileged citizens in rural areas

1. LP1 BUT

Target group remained mostly the same compared to the project proposal with a stronger need to be more open to the younger high school students too, which can cover also younger students (under 19 years).

The main target group will mainly include students of the Institute of Machine and Industrial Design (IMID) at the bachelor's and master's level. In total, there are approximately 150 students accepted at this institute. Approximately half of them study Machine design and half Industrial design. The Faculty of Mechanical Engineering has approximately 4,000 students. In 2024, IMID opens a new bachelor's program B-KSI Mechanical engineering design, where it directly addresses high school students, both Grammar schools and industrially specialized ones. Approximately 50,000 secondary school students studied in the South Moravian region in 2022 (heart of CZSO), which is the widest pool of potential participants.

2. PP2 FabLab Brno

Activities in the project will mainly focus on young people before attending universities.

Young people in this age group, especially those finishing secondary school, face the challenge of transitioning from general education to a specialized workforce. Many are entering the labour market with insufficient technical skills and limited exposure to digital fabrication technologies like laser cutting, CAD/CAM software, and automated systems. For this group, the challenge is twofold: they must gain not only the technical skills required for today's manufacturing jobs but also the soft skills such as problem-solving, critical thinking, and teamwork, which are essential in modern workplaces. The project aims to provide these young people with foundational training in digital fabrication that will boost their employability as they enter the job market.

3. PP3 HappyLab

Activities in the project aim to strengthen digital competencies in craftsmanship training. Happylab sees itself as a complement to traditional apprenticeship training, with a particular focus on digital tools that will increasingly shape the working day in the future.

For our pilot actions, HappyLab plans to target apprentices from two different Viennese institutions. The first one is "Jugend am Werk" with about 1.599 people, trained in 2022. They offer vocational training in 20 different fields. Jugend am Werk The second organization is "Wiener Linien". It is one of the largest

public training institutions in Vienna, annually training 480 apprentices in various fields. They also offer vocational training in 9 following: Neuer Bildungscampus für Wiener Linien Lehrlinge

Both organizations “Jugend am Werk” and “Wiener Linien” are facing the challenge of providing their apprentices with the necessary digital skills as part of their future training.

In the project, we will work together with the aforementioned educational institutions to develop and implement pilot activities aimed at improving digital skills. Both partners offer a wide range of training programs. During the pilot phase, we will focus on a few of these programs. The selection will be made jointly with the educational partner.

Happylab's collaboration with the local institutions that are mentioned above, supports two important goals of Vienna's strategy. Firstly, it aligns with the city's focus on fostering innovation and digital literacy by helping prepare employees with relevant future skills. Secondly, through its accessible workshop content applicable to various apprenticeships, it addresses the challenge of skill mismatches and promotes the integration of marginalized groups such as older workers, migrants, and low-skilled individuals. This approach contributes to creating a more inclusive workforce and supports the city's efforts to provide targeted training and upskilling programs.

4. PP4 brigk

The target group remains the same as it was planned in the proposal - Small and Medium-Sized Enterprises (SMEs).

Small and Medium-Sized Enterprises (SMEs): in Region 10, including their employees, form a crucial part of the local economy. These SMEs, which account for 60-70% of suppliers and service providers to large industry leaders like Audi, often have limited resources and face significant challenges in adopting new technologies. Their workforce primarily consists of skilled workers experienced in traditional manufacturing processes, but many lack the digital fabrication skills needed for modern production environments.

5. PP5 NOI

The mission of NOI Techpark is to support companies along their road in research and development. This is therefore also the target of the DiSTT project. More specifically, approximately 90% of companies in South Tyrol employ fewer than 10. However, after the first few months of reflection and survey construction, we decided to set a minimum of 5 employees as the bar, in order to increase the impact (multiplier effect) and have a better chance that at least one employee will participate.

Small to medium-sized enterprises and artisan businesses face challenges in keeping up with larger enterprises during the digital transformation due to their size and remote location. Additionally, finding workers with the necessary digital skills to work in these businesses can be difficult, especially in remote areas. In fact, despite its central location between northern and southern Europe, South Tyrol's mountainous conformation makes it difficult to reach many areas of the region. That is why we chose this target group, hoping that the DiSTT-offer will help them adapt to new job requirements or transform their traditional activities, combining traditional manufacturing skills with digital ones, enabling them to withstand market changes. Our offers will naturally also be aimed at individuals who may not currently be employed but could acquire skills that companies are looking for, so that they can be hired and re-enter the labour market.

However - as one of NOI's mottos goes - the power of diversity is crucial! We will therefore try, whenever possible, to create a mix of participants, involving incubated start-ups or larger companies so as to foster mutual exchange and support.

6. PP6 Zagreb

Target group remains the same, with focus on children with disabilities, where we cooperate with following institutes.

Centre for Upbringing and Education Slava Raškaj: The Centre serves children and young adults with hearing and speech disabilities. This group faces unique challenges in acquiring digital and manufacturing skills due to communication barriers and a lack of tailored educational materials. For these students, learning digital skills requires adaptive technologies and customized training programs. The centre focuses on preparing these individuals for integration into the workforce, and targeted digital skills training in manufacturing could help bridge the gap for them to enter Industry 4.0 careers. However, barriers include limited access to assistive technologies and specialized trainers.

Society for Dystrophies Zagreb: The Society for Dystrophies Zagreb focuses on individuals with muscular dystrophy and other neuromuscular disorders. This target group often encounters physical barriers in accessing traditional manufacturing jobs. Automation and digitalization in manufacturing could provide opportunities through remote work and adaptable roles like monitoring automated systems or using specialized software for digital design. The challenge is creating accessible training programs that address both their physical limitations and their need for digital literacy. Tailored interventions, such as remote learning platforms and assistive technologies, are crucial for equipping these individuals with relevant skills.

SOS Children's Village: The SOS Children's Village primarily works with children who are without parental care or from vulnerable family backgrounds. The challenge for this group is that they may lack the social and financial support necessary for pursuing advanced training in digital manufacturing technologies. While these children often have access to basic education, exposure to digital manufacturing tools is limited. Programs focused on mentorship, early exposure to STEM, and access to digital labs could help bridge this gap, providing these children with the skills necessary for future careers in smart manufacturing.

Klinča Sela Elementary School: Klinča Sela Elementary School serves children from rural areas where access to advanced digital technologies is often limited. These children, like others in under-resourced schools, may not have access to the same level of digital education that is available in urban centres like Zagreb. The school would benefit from programs that bring digital skills into the curriculum, such as hands-on workshops on robotics, coding, and basic automation. These initiatives could help prepare students for future roles in manufacturing, especially as the sector becomes more digitally driven.

E. Implications for Project Activities

The South Moravian region is creating a demand for digital skills in manufacturing, which the university aims to address through its strojLAB by enhancing teaching programs and filling skill gaps identified by industry stakeholders seeking specialized training in areas like algorithmic modeling, CAD software related to digital manufacturing (PP1: BUT). Meanwhile, FabLab Brno focuses on youth aged 15 to 19, emphasizing the need for foundational skills in digital manufacturing and soft skills development. Stakeholder feedback highlights the importance of hands-on workshops in 3D printing and CNC machining, along with team collaboration, to prepare students for industry demands (PP2: FabLab Brno).

In Vienna, research indicates a strong need for advanced digital skills in vocational training, and stakeholders have emphasized integrating digital competencies into traditional craftsmanship to meet evolving industry

requirements. The plan includes tailored training within existing apprenticeship frameworks, focusing on comprehensive skill development in digital fabrication technologies to address identified skill gaps (PP3: Happylab).

As for SMEs in Germany, they face challenges in adopting digital fabrication due to limited resources and a dependency on larger companies. Thus, targeted training programs are essential, focusing on practical skills in CAD/CAM and automation. Additionally, financial support and mentorship will facilitate the transition, while collaborations with educational institutions will ensure that training aligns with industry needs (PP4: brigk).

The urgency for upskilling in digital manufacturing is underscored by stakeholder feedback, highlighting the need for broader research into training support. The project aims to offer consulting services and enhance skill lists based on industry feedback, targeting both pioneers and laggards in technology adoption (PP5: NOI).

Lastly, addressing skill shortages and barriers for underrepresented groups in digital manufacturing is crucial. Proposed activities will include inclusive training programs for individuals with disabilities and students in rural areas, with partnerships involving local authorities and industry leaders being essential for practical training and fostering access to digital tools, thus ensuring broader participation in the digital economy (PP6: FL Zagreb).

1. LP1 BUT

The region of South Moravia, i.e. the entire Czech Republic, is industrially oriented, with the areas of automotive and heavy industry dominating. Companies in the Czech Republic are still going through the transformation to Industry 4.0. Related to this is the increased demand for digital skills and IT employees. Our university offers a wide range of technical subjects including those focused on digital skills such as 3D printing, 3D scanning and inspection, CAD/CAM software, etc.

We perceive that the fablab infrastructure at the university has the potential to develop a common dialogue about the needs of individual stakeholders and the subsequent formation of teaching programs. Future RE/UPs can be helpful not only for bridging gaps in skills but can also positively influence the teaching process itself in the sense of better addressability, visibility and attractiveness.

1.1. Feedback from stakeholders:

The subjects taught cover a wide range of skills required by companies (based on interviews with companies). However, there are also higher demands for deeper or more specific skills that employers would appreciate in their employees. They are, for example: Grasshopper for algorithmic modelling, optimization of digital models for 3D printing, MKP of structured parts, inspection of 3D scanned parts including scripting Python, deeper GD&T and standard knowledge.

Some industry partners perceive the need for digital skills in manufacturing (e.g. 3D printing) in the short term and perceive them as less acute. On the contrary, they consider knowledge of CAD software to be fundamental and assume that school graduates will have a good foundation in it. This situation seems to reflect the fact that the main burning need is still software digital skills, which are already an essential necessity for almost every profession in the industrial segment. Digital manufacturing, on the other hand, is still gaining ground at the expense of traditional manufacturing, while we can see differences between companies in terms of size. Large enterprises are more inclined towards automated processes for which digital skills are necessary. Legislation, standardization, reliability and thus the ability to guarantee consistently high quality are often held back. Smaller companies are more flexible in this regard, but digital technologies in manufacturing often cause the demand for skilled labour to increase more slowly. Which

digital manufacturing systems sometimes replace. Common to all groups is the increase in the need for experts, preferably seniors, who are capable of qualified maintenance of a sophisticated production system. Together with the growing adaptation of LLM models (Ai, Chat GPT), which often replace junior positions, there is a concern about how experience will be transferred to junior positions if the ecosystem of their traditional interaction is disrupted by artificial intelligence. We believe that this is also one of the challenges that we have to face within the framework of RE/UP programs programs, because one of the skills in general demand is the ability to solve problems, to be flexible in thinking and not necessarily stick to established routine processes, to have the ability to work in a team and the ability to name problems correctly.

1.2. Feedback from survey

(more details in D 1.1.2.):

1.3. Key implications to our project activities and future re/up programs

Based on research and discussions with stakeholders, we name the following priorities:

1. “coding” mindset for engineers
2. From theory to practice - to increase practical skills with digital technology
3. Focus on aspects of the collaborative teamwork (e.g. engineers and designers)

Skill gaps identified in project proposal (confirmed):

1. Metal powder additive manufacturing skills for engineering applications
2. Skills for democratized robotic fabrication with 6-axis robotic arms
3. Algorithm aided design of parts for direct digital manufacturing and data driven design
4. 3D part digitization skills for driving quality of digital manufacturing
5. CNC and hybrid manufacturing related skills
6. **Laser and vinyl cutting**

Based on consultations with partners and the fact that our participants are largely students of industrial design, we decided to include separate laser and plotter technologies, point number 6, see above.

2. PP2 FabLab Brno

The research findings for FabLab Brno’s target group, young people aged 15–19 entering the labour market, highlight the need for foundational training in digital manufacturing technologies, coupled with the development of essential soft skills. These findings imply that the RE/UP programs designed by FabLab Brno should focus on providing both technical and personal development to prepare this group for the evolving demands of the industry.

2.1. Feedback from stakeholders:

The programs will be structured around hands-on workshops, introducing students to digital fabrication tools like 3D printers, CNC machines, and laser cutters. These workshops will not only enhance their technical

proficiency but also improve their problem-solving, teamwork, and adaptability—skills critical in modern manufacturing environments. Collaboration with local industry partners will ensure that the programs remain aligned with market needs, providing students with opportunities for internships or apprenticeships that offer real-world experience.

A local high school teacher commented on the program, saying, "This initiative fills a critical gap in our current curriculum. While students learn theoretical concepts, they often lack hands-on experience with modern manufacturing tools. By collaborating with FabLab Brno, we can give our students practical skills that will make them more competitive when they enter the workforce or continue their studies in technical fields."

An engineer also noted, "The skills provided through this program are exactly what we're looking for in new employees. Digital fabrication, problem-solving, and teamwork are crucial in today's automated manufacturing environment. Programs like this will help bridge the gap between education and the industry, ensuring we have a pipeline of skilled, job-ready candidates in the near future."

2.2. Feedback from survey

(more details in D 1.1.2.):

The survey results reveal that high school students primarily lack practical skills in digital fabrication technologies such as 3D printing, CNC machining, and CAD design. Most participants are interested in reskilling or upskilling programs to prepare for future careers, preferring hands-on workshops or hybrid courses that combine in-person and online learning. Key motivations include career advancement and complementing existing skills. However, barriers like program cost and location/accessibility were noted, suggesting that affordable and flexible programs will be crucial to ensure broader participation.

2.3. Key implications to our project activities and future re/up programs

1. Tailored Training Programs: The project will create RE/UP programs specifically designed for high school students, focusing on developing practical skills in digital fabrication technologies such as CNC machining, 3D printing, and robotics, along with soft skills like teamwork and problem-solving.
2. Industry Collaboration: Working with industry partners like Honeywell and local companies will ensure the curriculum aligns with real-world needs. This partnership will offer students valuable internships and practical experience, preparing them for the evolving job market.
3. Practical Learning Environment: FabLab Brno will provide high school students access to advanced tools and technologies, offering hands-on learning opportunities that bridge the gap between academic education and industry requirements.
4. Generational and Gender Diversity: Addressing generational shifts and gender imbalances in the workforce will be crucial. The project should integrate strategies to attract younger workers and encourage more women to participate in technical roles, especially in digital manufacturing.

Skill gaps identified in proposal (confirmed):

1. From Idea to Design: Many need more training in CAD software and design thinking to translate concepts into digital designs. As industries increasingly rely on digital tools, developing these skills is essential for effective problem-solving and innovation.
2. From Design to Prototype: Moving designs into functional prototypes requires hands-on experience with tools like 3D printers and CNC machines, which often need to be added to traditional education.

Training in digital fabrication technologies can bridge this gap, making participants more employable.

3. From Prototype to Product: Scaling a prototype into a final product involves knowledge of production processes and cost-efficiency, skills often needing to be improved in students. Teaching how to navigate this step equips participants with the practical know-how for product development might not be the main focus of FabLab Brno.

3. PP3 Happylab

We reached out to crucial institutions in Vienna to get a better understanding of what large and public vocational training facilities might need in the future. The decision-makers in these institutions are well aware of the challenges that come with digitalization in many areas. While some initial educational measures have been implemented in certain areas, they are far from reaching the scope that we aim to achieve with our program within the framework of this project.

The baseline study findings emphasize the critical need to integrate advanced digital skills into traditional craftsmanship training in Vienna. As technological advancements and digital literacy become increasingly important, our project will focus on enhancing these competencies within vocational training programs at "Jugend am Werk" and "Wiener Linien.

3.1. Feedback from stakeholders:

We reached out to crucial institutions in Vienna to understand the future needs of public vocational training facilities and presented the DiSTT project, its goals, and potential collaborations for pilot actions. Our main stakeholder “Wiener Linien” and Jungend am Werk” are both facing challenges and have specific needs in meeting their internal digitalization goals. Our project aims to strengthen digital competencies in craftsmanship training, complementing traditional apprenticeship programs with a focus on digital tools that will increasingly shape future workplaces. While both partners offer extensive training programs, we will focus on select programs during the pilot phase, chosen in collaboration with them.

3.2. Feedback from survey (more detailed in D 1.1.2.):

Our survey mainly answered by apprentices at "Jugend am Werk" and "Wiener Linien" revealed a significant knowledge gap across all digital fabrication technologies, including 3D printing, scanning, laser cutting, CNC machining, CAD design, electronics, and robotics. However, the majority of participants showed strong interest in upskilling programs, primarily motivated by career advancement opportunities and skill development.

We plan to integrate the training program into the existing apprenticeship framework during regular work hours. Our two main objectives are to provide a comprehensive overview of digital fabrication technologies and to develop an effective workshop format that combines these key technologies, all in coordination with our partner organizations.

3.3. Key implications to our project activities and future re/up programs

The survey reveals that apprentices from our partner organizations "Jugend am Werk" and "Wiener Linien" lack practical skills in various digital fabrication technologies, including 3D printing and scanning, laser cutting, CNC machining, CAD design, electronics, and robotics. A significant majority of participants (77%)

expressed interest in or would consider joining a reskilling or upskilling program. Their primary motivations include "widening their experiences" and gaining "opportunities for career advancement." Participants also noted that the program would be "complementary to their current skills."

Our planned activities will be coordinated with the partner organizations and co-designed to meet their formal organizational requirements. Given the significant knowledge gap in digital fabrication revealed by the survey, our goals are twofold:

1. Provide participants with a comprehensive overview of the mentioned digital fabrication technologies.

2. Design a workshop format that effectively combines the key technologies identified in this survey.

Skill gaps identified in project proposal (confirmed):

1.Digital Skills integration:

- Prioritize incorporating digital tools and methodologies into selected training programs, ensuring apprentices are proficient in both their trades and essential digital skills.
- Focus on developing skills in concept development, planning, and design of new products, as well as the optimization and further development of existing products.
- Integrate training on CAD software for designing 3D print files, addressing the growing demand in digital manufacturing technologies.

2.Tailored Training Programs:

- Work closely with local institutions to tailor training programs that meet the specific needs of the regional labour market, ensuring our initiatives align with local strategic goals and industry requirements.

3.Targeted Training and Skill Gap Bridging:

- Develop specialized modules for career starters, job seekers and older workers, like career changers or low-skilled individuals to address labour market mismatches and promote greater inclusion.
- Focus on bridging identified skill gaps, particularly in areas mentioned above.

4.Future-Oriented Skill Development and Practical Learning Environment:

- Anticipate future trends in manufacturing and design, preparing trainees for emerging technologies and methodologies in product development and process optimization.
- Emphasize the importance of adaptability and continuous learning in rapidly evolving technological environments.
- Providing a project-based learning and offering hands-on learning opportunities

By focusing on these technologies and areas, we aim to create robust, inclusive, and future-oriented training programs. These programs will not only address current labour market needs but also anticipate and prepare for future trends, ensuring a skilled and adaptable workforce in Vienna.

4. PP4 brigk

Digital fabrication represents a significant shift from traditional manufacturing methods, requiring substantial technological investments and a comprehensive retraining of the workforce. For SMEs, this transition is particularly challenging due to their limited financial and human resources. Moreover, the integration of these technologies often necessitates a fundamental change in business operations and culture, which can be met with resistance from both management and employees.

Feedback from stakeholders: Resource Constraints: SMEs often lack the financial capacity and technical expertise to invest in advanced digital fabrication technologies. This makes it difficult for them to keep up with the technological advancements required by their larger industry partners.

Dependence on Large Companies: SMEs are heavily reliant on big players like Audi, which makes them vulnerable to changes in these companies' operational strategies, including shifts toward more digitized and automated production processes.

4.1. What is Needed:

Targeted Training Programs: Customized training and upskilling programs must be developed to meet the specific needs of SMEs and their workers. These should include hands-on training in digital fabrication technologies such as CAD/CAM, automation, and data analytics, ensuring that the workforce is prepared for the demands of modern manufacturing.

Financial Support: SMEs need access to financial incentives and funding programs that can help offset the costs of investing in new technologies and employee training. This support is crucial to enabling SMEs to make the necessary technological upgrades.

Mentorship and Advisory Services: SMEs could benefit from expert guidance and mentorship programs to help them navigate the complexities of digital transformation. This support can assist in strategic planning, technology adoption, and workforce development.

Collaboration with Educational Institutions: Partnerships with institutions like Technische Hochschule Ingolstadt (THI) are essential for developing tailored educational programs that address the specific needs of the region's industries. These collaborations can ensure that the training provided is relevant and aligned with the latest industry standards.

4.2. Feedback from survey (more detailed in D 1.1.2.):

In a survey to identify digital skill gaps, brigk prioritized personal interviews over online surveys, engaging 29 respondents from eight SMEs. This approach allowed for in-depth discussions with business owners and employees, revealing a strong demand for skills in 3D printing, 3D scanning, CAD, AI, and data science. While most companies view their current skill levels positively, they seek to enhance capabilities in 3D printing and AI for greater flexibility and efficiency. Employers indicated a preference for in-person, project-based, modular workshops that align with work schedules, emphasizing practical applications and soft skill development to boost engagement. Key barriers noted were cost and time. The survey, now incorporating an online component, will continue through year-end to further inform the development of flexible, skill-adjustable workshop design.

4.3. Key implications to our project activities and future re/up programs

1. Identifying Potential Participating SMEs: Target SMEs that are either directly involved in manufacturing or those looking to innovate their processes. Outreach will include partnerships with local chambers of commerce, economic development agencies, and direct invitations to businesses identified as needing upskilling.
2. Identifying Potentials in Employees: Seeking for personal interests that provide a basis for digital fabrication skills.
3. Preparing re/upskilling programs concerning Digital Fabrication and Soft Skills & Culture:
    - Preparation for Digital Fabrication: CAD, Vector Graphics
    - Basic Machine Operation Instructions: 3D-Printing, Laser Cutting, CNC Milling
    - AI Implementation: Prompting, (potential) use cases, API implementation of LLM, finding solutions
    - Team Skills

In conclusion we will try to implement two different approaches:

- Short/quick introductions: basic understanding of machines and their operations
- Workshop series: advanced instructions embedded into use cases and real problem solution finding (i.e. from idea to product, (rapid) prototyping), accompanied by additional skills and techniques (project management, agile, idea finding, team competences)

Skill gaps identified in project proposal (confirmed):

1. Additive Manufacturing techniques
2. Prototyping new products using digital fabrication methods
3. Utilizing artificial intelligence for development and prototyping
4. Implementing virtual reality for prototyping and testing purposes

The skill gaps can't be finally **confirmed** from desk research and exchanges with the public stakeholders. The survey results are crucial to a deep understanding of the SMEs' real needs and will sort out on what topics the program should finally aim to give best support.

5. PP5 NOI

5.1. Feedback from stakeholders:

The comparison with key stakeholders confirms their perceived urgency to invest in up/re-skilling programs for digital manufacturing. One of the main concrete outcomes of the dialogue with them was the need to broaden the scope of the field research, to include training support activities within broader actions: for example, providing consulting services to receive funding, facilitating meetings and experience sharing among companies, etc.

Another valuable contribution was in the list of skills to be investigated in depth. The list has been enriched with some nuances, but above all - thanks to the knowledge of the target - it has been made more easily understandable and less technical.

The involvement of experts in the survey was also facilitated by the willingness of stakeholders to explicitly express their support during the interview phase, strengthening the appeal of the ongoing research and thus the response rate.

A final point that had repercussions was the analysis of the academic part of our partner network. The presence of specific skills within the NOI Techpark, thanks for example to the university, has allowed us to open up the possibility of investigating needed support in a much wider range of skills than those exclusive to the Maker Space team. For example, in the field of artificial intelligence and robotics.

5.2. Feedback from survey

(more details in D 1.1.2.):

The self-assessment of businesses regarding the use of new technologies in production shows that there are both pioneers and laggards. There is a correlation with company size: smaller businesses often see themselves as laggards, while larger ones more frequently view themselves as pioneers. Overall, the responses indicate a clear demand for new technologies: only 3% of businesses reported not needing any new technology. The project's direction also seems correct, as a good quarter of the businesses indicated a lack of competent employees, especially in companies with more employees.

5.3. Key implications to our project activities and future re/up programs

Planning support measures for businesses in the field of digital production technologies is a task that must consider various dimensions. Although the DiSTT project defines employee training as a key measure, it is clear that businesses can also be supported in other ways. Support in applying for funding is considered useful by many businesses, especially smaller ones. Specific business consultations are also seen as beneficial by a significant majority of businesses, particularly larger ones. These insights were explicitly requested by local stakeholders, making them highly valuable for providing support beyond the specific focus of the DiSTT project.

When considering the depth of content that a training measure should aim for, it must be taken into account that there are both pioneers and laggards in the use of a technology. Both groups should be catered to. Overall, the responses from businesses indicate that the DiSTT project, with its focus on digital production technologies and training as a support measure, is on the right track. When selecting technologies for training measures, there is a challenge due to the lack of economies of scale, as certain technologies are only relevant to a few businesses. Therefore, the measures must be well-promoted. Collaboration with existing training institutions and associations is crucial for success.

Considering the issues of small sample sizes, initial measures will be developed in the well-established fields of CAD/CAE and milling/CAM, as well as in the newer fields of robotics and AI, where relatively many businesses have shown interest. In addition to content, formal aspects such as timing and training format were also captured in the design of training offerings. The distribution of preferences should be noted, although these aspects are probably not central to the decision of whether a business sends someone to training or not.

When looking at businesses that indicate a particular technology is relevant to them and then distinguishing whether it is already being used, the proportion of businesses not using the technology can be seen as an indicator of the need for support. Technologies that are often not used, despite being considered relevant, include:

- Cross-functional competencies for prototyping: This involves a systematic, iterative approach to developing new ideas and solutions using specific methods.
- Artificial Intelligence: The integration and application of AI in production processes.
- 3D Scanning and Data Integration into CAD Systems: The use of 3D scanning technology and the subsequent integration of this data into CAD systems

Skill gaps identified in the project proposal (confirmed):

1. Additive manufacturing
2. CNC machines
3. 3D digitalisation
4. CAD & CAM
5. IoT programming
6. generative design algorithms

The survey and desk research confirmed that these skills are considered important, and that additional support is needed. To this list, we also add artificial intelligence and the combination of traditional approaches with digital working methods. Additionally, cross-functional competencies in prototyping are also very useful.

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6. PP6 FL Zagreb

6.1. Feedback from stakeholders

We consulted key stakeholders in Croatia's industry and academic sectors to align the DiSTT project with their digital skill development needs. Industry leaders, including Končar and Rimac Automobili, emphasized the need for skills in automation, AI, and advanced digital production to meet Industry 4.0 standards.

Academic institutions, notably the University of Zagreb and its Faculty of Electrical Engineering and Computing (FER), highlighted their commitment to collaborating with the industry on digital skills training and research, with initiatives like CROBOHUB. This feedback underscores the need for comprehensive training programs that bridge industry requirements and academic expertise to enhance workforce capabilities in digital manufacturing.

6.2. Feedback from the survey

FabLab Zagreb conducted a survey of 57 respondents from underprivileged backgrounds to assess digital manufacturing skills and training preferences. The results showed that 81% lacked experience with technologies like 3D printing, CNC machining, and CAD, but many expressed a strong interest in reskilling for career advancement. Participants preferred interactive, hands-on workshops with flexible scheduling, including hybrid and weekend options, while identifying financial constraints, limited time, and accessibility as significant barriers. In response, the project will focus on foundational courses and free training programs with adaptable formats to enhance engagement and meet the participants' needs for digital skills development.

6.3. Key implications to our project activities and future re/up programs

1. Alignment with Project Goals: The identified challenges, such as skill shortages in digital manufacturing and barriers faced by underprivileged groups (e.g., students from rural areas or individuals with disabilities), align with the DiSTT project's objectives to address digital competency gaps. The project will need to focus on creating inclusive, accessible training programs for diverse groups, ensuring that those from underrepresented demographics can actively participate in the digital economy.

2. Proposed Project Activities: Based on these findings, the project should design reskilling/upskilling (RE/UP) programs that are tailored to the specific needs of the target groups, such as:
    - Providing assistive technologies and custom training for individuals with disabilities (Society for Dystrophies).
    - Developing STEM and digital literacy programs for young students in rural areas (Klinča Sela Elementary).
    - Offering early exposure to digital tools for children from underprivileged backgrounds (SOS Children's Village).

3. Metrics and Indicators: To monitor the impact, the project should track:
    - The number of individuals completing the digital skills programs.

- Improvements in employability or digital competency levels among the target groups.
- Uptake of digital tools and technologies in regional manufacturing hubs.

4. Potential Partnerships and Collaborations: Collaboration with local authorities, universities (e.g., University of Zagreb), and industry leaders (Končar, Rimac Automobili) will be essential to deliver practical training and integrate industry-relevant technologies into the RE/UP programs.

5. Collaborative Approaches: A multi-stakeholder approach involving public authorities, industry, academia, and civil society will foster collaboration to create inclusive training environments, ensuring that underprivileged groups gain meaningful access to the digital economy.

Skill gaps identified in project proposal (confirmed):

1. digital design and digital fabrication in synergy with traditional skills
2. specific focus on 3D printing

F. Executive Summary (conslusion)

Labor markets are stable but show notable variations in demand for digital and technical skills, particularly in CNC operation, robotics, and automation, as Industry 4.0 technologies reshape production (Czech Republic, Germany, South Tyrol). While unemployment remains low overall, significant skill mismatches exist, especially in digital fabrication, where only a small percentage of the workforce has ICT-specialized roles (Croatia, Austria). Educational attainment significantly impacts job security, with higher education levels linked to lower unemployment rates, while those with basic education face greater risks (Czech Republic).

Workforce dynamics reveal shortages in skilled labor due to aging demographics, prompting companies to modernize production processes to attract younger talent and control costs (Czech Republic, Germany). Gender imbalances in technical fields persist, but companies recognize the importance of increasing diversity by recruiting more women into digital manufacturing roles (Czech Republic, Croatia). Employers are exploring flexible work options, such as subcontracting and part-time roles, to meet labor demands, creating new opportunities for smaller enterprises and entrepreneurs (South Tyrol, Croatia).
Public initiatives are crucial for addressing digital skill gaps, with national programs focusing on upskilling, revising ICT education curricula, and boosting digital literacy (Czech Republic, Austria, Croatia). Support for digital transformation, including lifelong learning in advanced manufacturing and IT skills, aims to enhance workforce adaptability (Austria, Germany, South Tyrol). SMEs particularly struggle to access resources for digital transition but benefit from collaborative initiatives with innovation hubs (Germany, South Tyrol). These efforts, supported by both public and private sectors, aim to foster resilience and adaptability in regional economies through continuous skill development and digital transformation.

The project collaborates with public authorities to enhance labor market strategies and digital transformation initiatives. Key agencies in the Czech Republic, like labor offices and chambers of commerce, monitor employment trends and support skills development. Innovation hubs and research centers, such as JIC and INTEMAC, connect academia with industry to promote digital manufacturing

through training programs. In Italy, the Innovation, Research, University and Museums Department of Bolzano fosters scientific and economic development, strengthening ties between academia and the productive sector. Austrian employment services focus on funding and training to improve digital competencies, while organizations like waff emphasize upskilling. In Germany, business support entities assist SMEs with integrating digital tools, and innovation centers promote technology adoption. In Croatia, government bodies establish policies for digital transformation and sustainable economic growth.

The project engages industrial partners to identify the digital manufacturing skills needed by employers. In the Czech Republic, interviews with representatives from various enterprises provide insights into the skills required for digital fabrication and automation. Public training institutions in Austria enhance vocational training, while industry leaders in Germany set standards for training programs. Associations in Italy support local businesses by connecting them to the project and offering consulting and educational services. Innovators in Croatia contribute to skill enhancement and industry innovation through advanced manufacturing techniques.

Academic institutions are involved in improving digital skills in manufacturing. Brno University of Technology (LP1) facilitates collaboration among departments, while another partner (PP2) offers additive manufacturing courses. Cooperation with vocational schools (PP2) helps implement tailored educational programs. Public institutions in Austria emphasize digital competencies in apprenticeships, aligning with new training regulations. Universities and research institutions in Germany and Italy focus on digital transformation, providing specialized training. In Croatia, the University of Zagreb collaborates with industries to support research and development in robotics and AI.

The project targets diverse citizen groups, including university students, young job seekers, craftsmen, SMEs, and rural residents needing digital fabrication skills. The lead partner (LP1) engages high school and university students in STEM fields, while another partner (PP2) gathers feedback to shape relevant courses. In Vienna (PP3), current students and job seekers are targeted for reskilling through digital manufacturing skills. A Bavarian partner (PP4) emphasizes STEM education for SMEs. Another partner (PP5) promotes participation from companies and the public in a technology park. In Zagreb (PP6), programs address demographic challenges by providing digital skills training for both young and older citizens, enhancing employability and participation in the digital economy.