

PARK

Guiding Design Leaders



WP5

Interviews



Consolidation:
Key insights



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Introduction

User-centricity is key to ensuring excellence In Talentjourney, as all interactions that occur within regional and EU-wide ecosystems in the area of CDS/IoT In Smart Manufacturing have a significant impact on the learner and on their education.

Ensuring excellence in the development of Talentjourney requires thoroughly analysis of qualitative information tied to the stakeholders and interactions that together create the context and build the scenario for CDS/IoT in Smart Manufacturing in Europe. The stakeholders within regional and EU-wide ecosystems are intensively connected to each other, and all of the interactions that occur within them have a significant impact on the learner and on their education.

In order to embed user-centricity throughout the project and guarantee that the perspective of key stakeholders (both from the private and the public sector), as well as their challenges and needs are fully considered and potentially addressed in Talentjourney, the activities in Work Package 5 (WP5) have as a central point the use of Service Design (and broader Design) tools and methods. As a common practice in design research, the interviews play an important role in uncovering insights to drive the project forward.

Figure 1 showcases the overall WP5 planning, divided into 4 different stages: explore; define & ideate; consolidate; deliver. The 'explore' stage has the interview as a starting point, which will then drive the creation for other deliverables, such as ecosystem maps, personas, and user journeys. The input from these documents will then later support the creation of a vision, service blueprint, roadmap and memorandum of understanding for common collaboration for Talentjourney.

Interviews were focused on different groups of stakeholders: learners, tutors, companies, and Talentjourney partners. This document contains the main insights captured in these interviews , with the overall intent to provide an objective and straightforward outlook of the findings, stimulate discussion, and set a direction for the development of the WP5 activities.

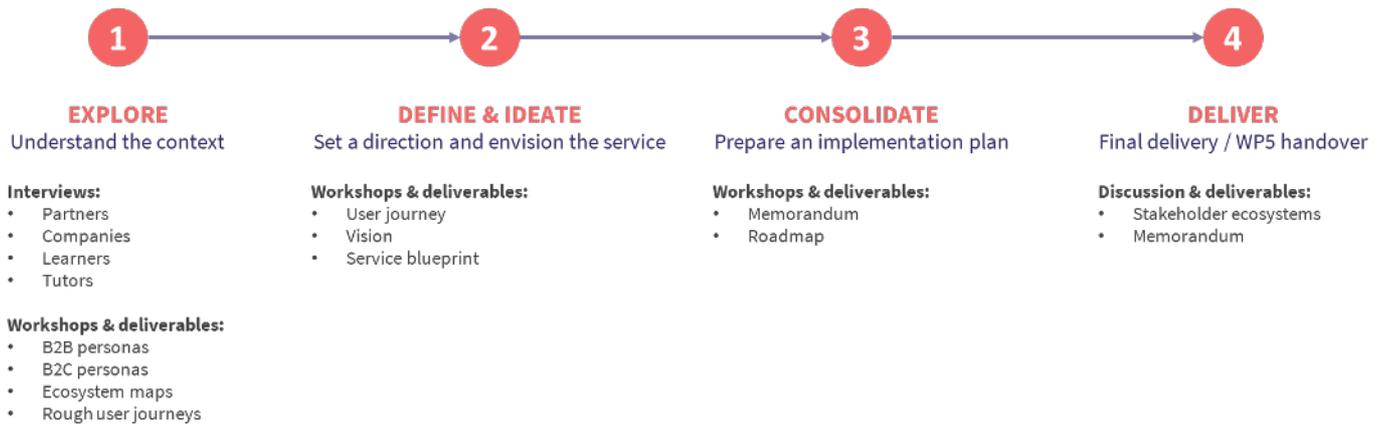


Figure 1: WP5 planning

It is important to note that there is a degree of subjectivity to these insights – they are not always based on hard facts, but also on the perception of the interviewees. This approach is key for the exercise of empathy, and it is a first step to understand the learner experience and all of the aspects (either visible or hidden; close or far) that surround it. Although all information captured in the interviews are not outlined in this document, the WP5 deliverables will be created using the full data collected as a foundation.

Interviews planning

Interviews were conducted with learners, tutors, companies and Talentjourney partners, with the specific regional focus on Estonia, Finland, Northeast Italy and Slovenia.

Interviews were planned with the intention to gather key insights and information to drive the WP5 activities and deliverables. They were conducted in a semi-structured format, allowing for flexibility and interventions, with empathy at the core of the approach. The interview focused on the following objectives:

- Map the profile of key stakeholders to further understand their perspective in the context of IoT in Smart Manufacturing and education (e.g.: strengths, challenges, opportunities)
- Understand and map the learner experience in order to identify the potential areas for improvement
- Understand current and potential relationships and interconnections between different stakeholders (on a regional and EU level)
- Gather key insights about regional differences regarding education and the CDS/IoT in Smart Manufacturing sector
- Drive the creation of personas, user journeys and ecosystem maps for WP5.

Participants

The interviews were conducted virtually from April to July 2020. In order to gather diversity of thought and perspective, different types of stakeholders in each region were interviewed, summing to 33 interviews:

Estonia	
Talinn Polytechnic School (VET provider)	Andres Ojalill Director/Development Manager
	Helen Pärk Headmaster
	Ege Meister Project manager
Estonian Electronics Industries Association	Arno Kolk Managing director
	Aivar Usk R&D Advisor
Tutors	Kaupo Nõlvak Teaches for 10 years now; 50% of his time is dedicated to teaching and 50% to working; teaches computer hardware/computer network
	Toivo Pärmpuu Works as a teacher since 2011; teaches cloud computing and is heading one school department
Learner	Andri Jaagant 22 years old, studying telecommunications at Talinn Polytechnic School
	Karl Erik Karbus 17 years old, studying telecommunications at Talinn Polytechnic School
Finland	
SATAEDU (VET provider)	Matti Isokallio Director
	Anne Laine Principal

	Marko Kempainen Head of International Affairs
	Jaakko Niemelä Project lead
	Jari Pentinmäki Instructor
SAMK (university of applied sciences)	Jari Multisilta President, Managing Director
	Janika Tommiska Project manager
	Peter Virtanen Project manager and teacher
Dyme Solutions Oy (company) Software company – provide consultancy/data to improve processes; run projects related to software-engineering; run their own mobile app (overall focus is to help students to find opportunities to discover new hobbies)	Kai Vainio Founder and software engineer
Sermatech Works Oy (company) Automation integrators – design, build, assemble and install production systems (have capabilities for working on the mechanical, electrical and software parts)	Jani Uusitalo Owner and CTO
Tutors	Sari Melampi Principle lecturer/professor at SAMK, as well as researcher in the healthcare field – combines health/well-being and technical expertise (studied electrical engineering/mechatronics previously)
	Eero Matintalo Teaches in the electrical department; teaches basic electronics to first year students and automation

	techniques to third year students; has been teaching for 20 years now
Learners	Sanni Sjöholm 22 years old, studying IT, automation and artificial intelligence at SAMK
	Matias Marttila 29 years old, studying automation technology at Sataedu
Italy	
ECIPA (sector representative)	Andrea Jester Associate partner
	Simona Aceto Project manager
	Laura Castellan Business Innovation Unit
ISIS Malignani (VET school)	Santino Bandiziol Spokesman for the Principal
	Sara Ciganotto Supervisor of pedagogical processes
	Cecilia Rizzotti Coordinator of School-to-Work projects
Maddalena S.p.A (company) Water/hydraulic meters manufacturer	Alessandro Budai R&D manager
Company consultant	Eleonora Di Maria Management professor at the University of Padova; focuses on digitalization technologies and how they are adopted by companies for strategic purposes: coordinator of the digital lab since 2014

Tutors	Federico Busato Areas of focus are mechanical development, automation and prototyping; teaches at ISIS Malignani technical school and at the community college ITS); has been teaching for 4 years now; teaches full time and works in the industry as a freelancer
	Elena Mainardi Phd in information engineering: electronic design freelancer since 2010; teaches vocational and university students
Learners	Luca Daffara 18 years old, studying information technology at ISIS Malignani
	Lorenzo Baldo 39 years old, studying mechanics at ITS
Slovenia	
Šolski Center Nova Gorica (VET provider)	Miran Saksida Director
	Egon Pipan Headmaster
	Adrijana Hodak Project leader Talentjourney
Šolski Center Kranj (VET provider)	Jože Drenovec Director
	Aljaž Rogelj Headmaster
	Nataša Kristan Primšar Head of Intercompany Education and Training Centre
Šolski Center Velenje (VET provider)	Janko Pogorelčnik Director

	Uroš Sonjak Headmaster
	Igor Doler Project manager
CPI (Institute of the Republic of Slovenia for Vocational Education and Training)	Janez Damjan Director
	Boris Klancnik Senior advisor
	Bostjan Kosorok Senior advisor
Mahle (company) Supplier and development partner in the automotive industry	Iztok Špacapan Head of product development Electric drives systems
	Damijan Mihelj Head of operation IT
	Jadran Gorjan Head of business division Mechatronics
	Robert Vodopivec Head of product development Actuators & Auxiliaries division Mechatronics
	Matevž Tavčar Head of production Engineering Electric Actuators & Auxiliaries
	Peter Jan Head of Human Resources Mahle Slovenia
El-Art (company) Operates in the field of automation by providing services related to the design of electrical parts and software; provides maintenance of systems and connects industrial machinery	Janko Šink Partner and managing director

Tutors	<p>Aleš Kozjek</p> <p>Worked for over 20 years in the industry (mostly in toolmaking); has been working for 2 years as a teacher at Šolski Center Kranj; is in charge of teaching CAD modelling to the technical high school and the vocational school; also teaches practical classes in the vocational college</p>
	<p>Klemen Zaponšek</p> <p>25 years old, finishing his master degree in mechatronics; has one year of teaching experience; before teaching worked on developing systems for complex applications</p>
Learners	<p>Vesna Simonič</p> <p>19 years old, studying nursing at Šolski Center Nova Gorica</p>
	<p>Martin Bizjak</p> <p>33 years old, works at Mahle and is pursuing a phd in management (did his master degree in engineering and management)</p>
	<p>Aurora Lešnik</p> <p>19 years old, currently finishing her education in nursing at Šolski Center Nova Gorica</p>

Framework

A different interview framework was prepared for each type of stakeholder. Interviews with organisations took 90 minutes, while interviews with learners and tutors took 45 minutes. The following aspects were covered:

Learners:

- Motivation, challenges and goals
- Learning experience

- Work experience
- Long-life learning

Tutors:

- Motivation, challenges and goals
- Experience with learners and school
- Teaching approach
- Role of the tutor

Talentjourney partners and companies

- Motivation, challenges and goals
- Regional context on CDS/IoT in Smart Manufacturing
- Other stakeholders and collaboration
- EU context on CDS/IoT in Smart Manufacturing.

The questionnaires prepared for the interviews can be found in the annex, at the end of this document.

Findings & Insights

Through a systemic analysis it is possible to conclude that all findings and insights are interconnected to each other. All aspects that emerge on the surface of an ecosystem are actually rooted in a complex network of relationships that embrace social, economic and environmental aspects.

Due to the complex nature of EU- and regional-wide ecosystems, it is not possible to point out a given starting or ending point to the interactions that occur within them. Therefore, the uncovered insights are interconnected in all different directions, indicating causes and consequences of each other.

This chapter is comprised of six different subchapters. While the first four contain points that are relevant and similar to all regions; the fifth one focuses on key differences between them, and the last one focuses on Talentjourney as a project. Please note that there are no hierarchy in the findings – all insights are equally important and should be thoroughly considered. In fact, they all expand each others' meaning, being the comprehension of each important for the comprehension of the complete picture.

The insights uncovered here should be considered for the development of Talentjourney in all its WPs. In this way, the project may better ensure the consideration of all stakeholders perspectives, covering gaps, benefitting from opportunities and maximising the potential for VET education in CDS/loT in Smart Manufacturing in Europe.



Learners

*Motivation is key
to leverage their
potential*

“I want a future with exciting challenges.” – Learner, 21 years old

Two different groups of learners were interviewed: younger learners (ages 15-19), who are for the first time taking a secondary school degree; and older learners (ages 21-39), who have decided to take life-long learning forward by further continuing their studies or going back to school after some years.

Motivation, support and growth

Learners' motivation was one of the most discussed aspects in the interviews. It is central to their study performance, and it can highly affect the quality of the learning process. Lack of maturity, the pursuit of purpose, the need to

further understand the meaning behind their obligations and a 'culture of speed' all influence their motivation for studying. Their motivation, maturity and growth are also intrinsically connect to their support system.

“I think that I lost myself when I was a young learner because I was not able to focus on my skills. There should be more support – even psychological support – to allow youngsters to discover more about themselves, find their skills and learn how to apply them. When I attended school I felt I was just a number, and failure was considered to be only my fault. Having people to guide you is important, learners should not be abandoned by themselves.” – Learner, 39 years old

In connection to the reasons described above, the main insights below provide a more detailed description on the topic:

- A considerate amount of time and effort is needed to establish a solid foundation in technical areas such as electronics, mechanics and IT. This can sometimes be overwhelming, as younger learners still lack working discipline – they still need to ‘learn how to learn’, how to work independently and how to stay focused. The shift from elementary school to secondary school requires more maturity and better studying habits, and many might feel overwhelmed when trying to adapt to these changes, which can lead to inconsistency in their performance, demotivation and further drop-out. Older learners, on the other hand, might not be used anymore with the studying environment and demands, and in combination with challenges such as time and money (as many also have to provide for themselves), they might have low/inconsistent results and feel demotivated. They also may be confronted with the stigma of shifting the direction of their careers at a more advanced age. Therefore, building their confidence and ensuring they have a good support system (both in school and in their private life) is key to motivate and help them strive throughout life-long learning.
- Family, friends, romantic relationships and social groups have a strong influence on the learners' habits and behaviour. These relations help them to reflect further and deeper about who they want to become in the future, not only on a professional level, but also as a human being. Having emotional support and guidance is extremely important for the maturation process and a change of mindset – however, it needs to be personal, embedding a true sense of caring. This also helps them to grow habits that reflect their ambition– such as reading more, caring for their studies/own obligations or starting a meaningful hobby.

- Caring for hobbies and life experiences (e.g.: travelling, sports, music, etc.) can help learners to expand their perspective on life, having a better understanding of what they want to accomplish in their future, and how they would want to shape it. This also helps them to see meaning behind the learning process, which is key for them to stay motivated. They need to know why they are studying and how it can help them to achieve a better future, even though they might not be sure yet about how it should look like.
- Learners need to relate to their education environment. The knowledge, challenges and projects they are exposed to in the school need to be aligned to their reality and interests, and further help them to envision the future. For example, modern labs addressing exciting challenges and embedding the latest technologies can help to better engage them. Therefore, bridging their technical interests (e.g.: drone building) to their formal education can have a positive impact on their motivation and learning curve.
- Many learners (young and adult) have expressed the desire of creating a meaningful impact in society and in the world; many of them have ambitions related to environmental and social causes, and would like to have a career that embraces a higher sense of purpose.

The learning experience

Motivation, support and growth are processes that happen throughout the learning journey. There are key stages learners go through, either formally or informally (e.g.: school applications,

internships, final exams, self-learning), which create the context for their experience and further influence their thoughts and decisions for the future.

"It would be nice to have an idea of what to expect on a topic, subject or course – sometimes I wish that the journey could be predicted to have a better understanding of what to study; to see what are the possibilities out there. It would already be helpful if information on school and subjects was better organised and officially shared." – Learner, 22 y/o

Although relevant to inform some of the processes that happen in the learning journey, the insights below don't refer to it in a linear way, nor try to visualise it. The learning journey and experience will be depicted in more detail in the user journey map.

- Learners (mostly young) are unsure about the next steps to take at several steps of their learning journey. They believe they have to make a decision too young on their career/future studies, and throughout their studies many are not certain whether that is the field they want to continue in

life. The more job opportunities they see being offered in their field of study, the more secure it is likely for them to feel about the future.

- Learners would like to make a more informed decision on their future, and it would be helpful if it was possible for their journey to be predicted: what to expect from a certain school, from a class, from a course, from a job, from a career, etc.; what is the value behind each of those experiences and what are the possibilities to combine them (just like pieces of a dynamic and multi-faceted puzzle). In reality, they don't know what options they can pursue, and feel limited by only having the traditional routes already established in society as a path for the future (e.g.: university). Not having the opportunity to find/apply their talent can make them feel lost and demotivated. It is utterly important to communicate the value of other forms of education.
- Learners constantly have to face their insecurities and fear of failing, and these aspects also affect them as they develop their soft skills and approach for learning. The school should be understood as a safe zone – a place where all learners can experiment and also fail. Having the freedom to approach projects and try to solve the problem in their own way can allow learners to showcase their individuality and express themselves. This helps them to develop confidence, find their talent and further build their character. However, as this possibility is not always so clear, most of them automatically follow the system and abide to its usual practices/approach.
- Information should be clearly organized and communicated to students throughout the learning journey – from searching for a school to graduating. Information on different offerings (such as scholarships, internships, study groups, incubators for business development, etc.) are scattered, and most learners are not aware of them. Sometimes, content and instructions given in classes are only shared by classmates, and usually there is no universal platform that helps learners to find all the necessary data they need.
- Learners have expressed the need for more transparency on the study degree and related jobs/compensation as they make a choice for the future. It can happen that they may later become frustrated once they realise the potential for the jobs/compensation to be exciting/high is very limited. The same can be applied to the school/education: information should be clear and transparent from the beginning to avoid mismatched expectations.
- Learners would like to move from a passive role to an active one, making more decisions on their own education. As they already learn a lot by themselves (e.g.: searching the web, watching videos and online conferences), they would also like to teach and have co-ownership of the educational process and content.
- Although it is important to be proactive, learners feel the need to be guided and to have support as they try to advance in education. Their learning experience is highly dependent on the tutor – whether they truly care about the learners, whether they properly listen to them; and whether they use creativity to further teach and support the students. Personal support is also highly needed, however, 'coaching' on real life subjects can be sometimes dismissed or seen on a bad limelight by the system, as if it is only necessary for 'problematic students'.
- It can take time for a young learner to fully grasp the future potential and opportunities related to technology and automation, which can make it less attractive to them. On a first sight, other

'immediate' careers seem more appealing, such as becoming an influencer on social media. Learners need to have a clear understanding of what life-long learning means, with an overview of where they stand in their learning journey, and what skills and competencies they need to build for the future.

Learning gaps

In the interviews, a number of learning gaps were identified. Although these have a systemic nature, being rooted in several different aspects,

they have a great impact on the learners' performance and can highly influence their learning experience.

“Learners are more focused on analysing a problem than actually on being creative and trying to solve it. At the same time, they want to be more hands-on, but don't understand the value of theory and what it will enable them to do. They cannot start doing complex things without having the basics.” – Tutor, VET school and university

Please note that the insights below do not cover for all learning gaps, but rather try to highlight those that demonstrated to have a substantial impact in the learning experience:

- Due to their experience and confidence, older learners tend to be more mature and better presenters. On the other hand, although they have industry know-how, they have a higher gap when it comes to formal knowledge/theory. IT and computer-related subjects are an exception for them: although motivated, they lack skills with computers. They are hesitant in making mistakes and therefore don't have the confidence to carry out practical activities, as their previous experiences are usually more related to manual work. The situation is the opposite with younger students: most of the time they don't know how the theory is applied in reality, and would like to be exposed to more practical experiences; they are also not afraid of exploring possibilities with the computer.
- Although IoT may be mentioned in some classes throughout the degree, learners lack a proper understanding of how it translates to practice. They don't have an overview of how IoT (especially industrial IoT) is embedded and connected in different fields of study, as well as the application areas. One of the reasons for young learners to not be so fond of theory is this lack understanding of what is going to enable them to do; on the other hand, practical work helps theoretical concepts to become more tangible to them.
- Learners sometimes don't ask enough questions – which may lead them to approaching projects or challenges in an ineffective way, both in the classroom and in the work place. This can happen due to fear or obliviousness for their gaps. It is particularly harder for older students, as they are

more experienced and expect to have less doubts. Therefore, in order to ask questions, learners should know what are their knowledge gaps. The lack of a holistic understanding of their field of work makes more difficult for them to realise it, and being exposed to different activities and subjects may help them to broaden their perspective.

- For learners to have a rich profile in soft skills they also need to acquire them in real life, therefore, extracurricular activities can have a substantial role for the learning process. For example, sports and other team activities tend to have a positive impact in soft skills and on the learner's character, as they can help them with communication, commitment and discipline. In general, practical experiences help learners gain confidence about the future and about facing the market.
- Not all work-based learning is composed of practical experience. In some of them, students only observe, or don't do anything challenging outside their comfort zone. Prior to the internship, there should be a clear understanding of the value it will provide to the student.

Competencies/skills/knowledge

Throughout the interviews, it was possible to notice that both the education system and the industry still place a strong focus on technical skills. However, there is a growing realisation for the need of meta skills, as learners need to become well-rounded professionals who are capable of communicating clearly, collaborating with other stakeholders, and building the future

in an innovative and effective way. Although companies strongly emphasized technical/traditional industry skills more related to foundational knowledge, they also recognised the need and growing demand for green skills, as well as the importance of shifting towards a sustainable future.

“Soft [meta] skills are becoming increasingly more important. As we would like to share project responsibilities, many of our engineers are in direct contact with customers, so they need to be able to explain complex and difficult technical concepts to someone who doesn't understand much about it.” – Company, Finland

The competencies described below refer mostly to meta skills. The technical skills mentioned, on the other hand, are just examples provided by the interviewees, and do not cover all of the specific needs from the educational system and/or the industry:

- Envisioning & leadership: holistic understanding of the field, with ability to lead and connect different areas and envision future developments (business acumen)
- Project management: ability to implement a roadmap to reach the ambition, considering organisational and human resource shortcomings, as well as technological limitations (strong technical and business skills)

- Simplification: Technical knowledge combined with soft skills in order to communicate complexity in a simple way (consultant profile); as well as ability to reduce complexity
- Communication: ability to convey the desired message and meaning to different audiences in a clear way
- Multidisciplinarity: knowledge in different disciplines and ability to combine them while staying on top of new advancements (e.g.: machine programming, IT, mechanics, electronics, green skills)
- Strong operational approach: good overview of the entire process (understanding of bigger picture) with operational understanding on a specific discipline (e.g.: IT infrastructure)
- Systems thinking & analytical thinking for problem solving: proper judgement of when to use which; systems thinking - ability to analyse and understand complex systems and their interrelations (consider the whole, not only its parts); analytical thinking - ability to break down complex problems into single and manageable components.
- Team work: ability to collaborate and communicate with professionals from different backgrounds
- Flexibility: open to adapt to company needs and to function in different set-ups
- Presentation: ability to advocate and demonstrate value for what is being presented, as well as engaging the audience throughout it
- English skills: from being able to assimilate material in English to having professional proficiency
- Specific technical skills (for industry): skills related to a certain industry need (e.g.: firmware development)
- Technical knowledge (for education): basic algebra knowledge; higher understanding of analog and digital; knowledge in communication protocol; coding/programming; knowledge in working with computers/software; basic knowledge on automation techniques (e.g.: sensors)



Tutors

On a shift from delivering content to guiding learners

“The classical way of teaching is gone – teachers should be mentors; they should teach learners to think outside the box. Learners should be able to find their own answers, instead of being given the answers.” – Tutor, VET school

Although most of the tutors interviewed had the school as their main place of working, many of them were still connected to the industry. Regardless of the region and school they teach, all of them expressed similar challenges in their work, as well as had a similar understanding of how their role is evolving.

The role of the tutor

In Talentjourney, the use of the word tutor instead of teacher is intentional: there is an intrinsic difference that needs to be highlighted between the two. The teacher is associated to a more traditional approach, in which the main

concern is to provide knowledge. The role of the tutor, however, encompasses other responsibilities and has an extended meaning: they should guide the student to find the answer on their own, instead of providing them the answer.

"It is important for teachers to keep in contact with the real world. In the end, teaching and learning are the most effective when applied in real projects." – Tutor, VET school

The insights below not only refer to how the role of the teacher is evolving to the one of a tutor, but also covers other aspects that should be considered in their profession:

- As many tutors are still connected to the industry (either through a job or by having a company), they have a key role when translating companies' needs to the educational system. At the same time, this could be further explored: as many of them are also entrepreneurs, their experience and insight could be also shared with students to inspire them, help them build business competencies and develop an entrepreneurial mindset.
- Learning should happen in all directions: not only learners should learn from tutors and from each other; but tutors should also learn from students. In the many roles that a tutor can have such as being responsible for coaching, guiding, mentoring, leading, counselling, sponsoring and supervising; their role as a learner should also not be forgotten.
- Tutors also need soft skills and to focus on constantly improving themselves, not only from a technical perspective. Contact with the industry and other institutions, as well as nourishing social relations and having diverse activities in their personal life can help them develop their soft skills further. Furthermore, it is important for tutors to keep in touch with the world outside of the school, as not only teaching is most effective when applied on real projects and case studies; but as they should also prepare learners to face this reality in the future.
- The tutor plays a very important role for the learners – they are the ones who can motivate and inspire them on a daily basis for their future career; they are also the first contact of students with the industry. Therefore, their influencing potential should not be neglected – their daily input in the classroom is key to helping shape the learners' perception on the learning process and on the field of study/work.
- The role of the teacher is evolving: they are not only responsible for giving content in the classroom anymore, but rather help to shape and guide the learners' career path. Therefore, the teacher is increasingly acting more as a tutor – someone who helps the learner to recognise their

own potential; inspires them; gives them advice not only for school, but also for work and life; and helps students to notice their own gaps and find solutions for their problems.

- Besides teaching learners how to ‘learn’, tutors should also encourage critical thinking in learners, allowing them to develop their own mindset and judgement in all of the activities they carry on. This should allow them to think deeper on the meaning behind what they are doing, as well as its impact on several different dimensions in society and in the world. Many learners expressed that tutors who have committed to this principle have left a greater impact in their learning journey.

Challenges

Most tutors interviews expressed similar challenges in their daily work. Although there are limitations regarding the educational system and the school structure, those were not really

stressed. As a matter of fact, the challenge that was most expressed and placed higher in the priority list was related to the lack of motivation from learners.

“Materials in the area are expiring fast - they need to be updated every three years. We usually have older material from the school, so we need to find resources online for newer content.” - Tutor, VET school

Besides motivation, tutors expressed a few other challenges regarding their own profession. Please note that just four of them are listed below, as these were the most mentioned and agreed upon:

- It is difficult to teach students in the same class who are at different levels; especially when some of them are demotivated. Many tutors find hard to make use of more creative approaches and fully explore all the potential for a class when there is need for alignment on knowledge and motivation. Having a smaller group with motivated students (who are truly interested in the subject) is more productive and effective than having a large class with varying degrees of motivation.
- It can be a challenge for tutors to evaluate their own teaching. They are missing ways in which they can measure the efficiency and quality of their teaching, with a clear understanding of whether it is creating lifetime value for the student.
- Many learners come with knowledge gaps that should already have been covered (e.g.: basic algebra); therefore tutors also need to spend time reteaching basic theory to ensure they can continue with the official content for their class.
- As technology is in constant change, many times there are not updated books for some disciplines and fields of study. Teaching materials are expiring fast and tutors have to constantly update their content to follow the advancements, resourcing quite often to the internet. Lack of learning

materials in their native language (especially when it's a not widely spoken language) can also be a challenge - it's easier to find and provide materials in English.

Helpful teaching methods/tools

Tutors were asked which teaching methods and tools they found the most helpful in the classroom and with students. Although there was no ground-breaking tool mentioned, it is possible to realise how technology is becoming

increasingly more used in the daily classroom activities, especially after COVID-19. Many tutors have also realised the learning potential behind projects and hands-on work next to providing theory and guidance.

“It is useful/effective to record lectures so students can follow them at their own pace, as well as providing links and resources in combination. However, only students who are interested and motivated will take full advantage of what we provide to them.” - Tutor, VET school

The most mentioned teaching methods and tools were the following:

- Using short-videos prior to an activity that requires active learners' engagement.
- Allowing time for reflection after a lesson.
- Using tools such as web forums, cloud-share and YouTube in online classes to improve hard-skills and collaboration.
- Providing a guide for learners on relevant content in the web.
- Landing theoretical knowledge related to a project/activity shortly before conducting it.
- Stimulating students to address problems through projects.
- Using simulators to substitute labs and machines when needed.
- Guiding each learner personally in the exercises/activities given.
- Keeping materials updated and relevant
- Using tools and software often used in the industry to provide an idea of how it works in companies (even video conference tools, like MS Teams).
- Providing real challenges and projects
- Providing content/material for learners to study at home.
- Recording the online lessons and sharing with learners.
- Allowing learners to use mobile phones to document, communicate and solve exercises.



Education

Connecting disciplines for a holistic understanding

“Our main goal is to change the education system. We are still as not user-oriented and digitalized as we want to be..” - VET school, Slovenia

VET providers and a partner university were interviewed to better understand the educational context and perspective. Although levels/depth of content provided vary, schools across all regions face similar challenges regarding the implementation of CDS/IoT in Smart Manufacturing in the curricula and recruiting tutors, for example.

Context

Schools are embedded in a complex system, being subject to different organisations and regulations. The insights gathered do not have the ambition to refer to all processes that

happen within this system, but rather to point to meaningful aspects that affect the progression and quality of education.

“Learners should have the opportunity to discover their talent. As talent can thrive under any circumstances, our current rapidly changing scenario won’t then be an obstacle for them. We need to go beyond the traditional classroom and provide them interaction with the outside world.” – VET school, Italy

Please note that even though the insights below seem to vaguely refer to each other, they are intrinsically connected:

- The potential to combine disciplines in the Industry 4.0 with other fields of work (e.g.: healthcare) should be explored more often in education, providing students and schools more awareness of its potential. Although there is strong technical competency, education still lack a clear overview of the application areas and all the innovation potential for them
- The lack of a holistic understanding of CDS/IoT in Smart Manufacturing also affect knowledge and application related to sustainability; as well as the further development of green skills. The lack of a systemic/end-to-end perspective can lead to a lack of awareness of the impact of the industry in the environment and society. Nevertheless, many technical fields related to green skills (e.g.: energy efficiency and smart building) are expanding.
- While VET focus more on practical activities, universities focus more on theory and development. As universities are key to developing strategies and technologies, while VET providers are key to implement them; strengthening the link with each other can have valuable and positive impacts. There should be clear pathways to integrate VET application with university research and planning.
- In many cases, not enough time is allowed for learners to build a good foundation in knowledge and practice. As degrees are becoming shorter, gaining practical experience is a lot of times dependent on internships. However, companies cannot always afford to do this investment, except when they have a strong need for human resources.
- As the technical field (e.g.: engineering, automation, IT) can be inventive and innovative, it should also be possible for education to explore it this way. By nurturing a creative and innovative mindset in schools, tutors can be further motivated to find ways to improve the teaching process; while learners can find ways to make it more fun and engaging for themselves.

- Currently, innovation in the technical field is mostly driven by the industry, with schools and universities being rather ‘following’ than ‘leading’ in the area, distancing themselves from a visionary and disruptive profile.
- Vocational education can be sometimes perceived as ‘least prestigious’, with dedicated students being expected to enrol regular secondary school and then pursue university. This push can come from different directions (from family, friends or social convention, for example).
- COVID-19 has caused significant changes in education provision: tutors and learners are adapting fast to online tools, such as virtual classes/conferences and simulators. Collaboration and the further development of soft skills are still gaps that need to be covered in online education when compared to the traditional format.

Challenges

The uncovered challenges are usually associated to a broader context, which concern economic, social and environmental aspects that may or may not vary per region. Although the overall context for the educational system cannot be

easily transformed, schools still may adjust their response mechanisms according to the varying degrees of flexibility and independence provided to them.

“We have all the pieces of IoT somewhere in our programs, but they are all separated, disconnected. A step needs to be taken to connect them, so students can understand the bigger picture.” – VET school, Slovenia

Similar to the ‘context’ insights, the challenges bellow are also intrinsically connected, even if it is not immediately recognisable on the surface:

- Although embedded in some courses and subjects, CDS/IoT is in most cases not enough connected in the VET system. Schools still haven’t matured a structured plan/overview for it. Students lack an understanding of the bigger picture of the industry and its applications. This gap is also one of the biggest industry needs: professionals who have a holistic view of CDS and automation.
- Having diversity of stakeholders in a region and strong collaboration between them reflects directly on the opportunities and quality of education provided; and subsequently, on the workforce and on the development of the region and industry. For example, while VET education focus more on the end-use of CDS devices/IoT in Smart Manufacturing, universities and higher institutions have a stronger focus on research and development. Another example is how collaboration with technological parks can help improve learners’ entrepreneurial skills. However,

most VET providers interviewed face the challenge of having to look for collaboration with these stakeholders on a national or international level – not all of them are based in their local region.

- Although there are varying degrees of need depending on the school and region, the general high demand of workforce in the industry (with attractive opportunities and financial compensation) directly affects the supply of tutors for school - it can be hard to find and retain them, especially to work full-time. Many schools rely on their alumni network to attract them.
- It can be a challenge for schools to manage their human resources in order to balance between teaching activities and research/projects. This directly affects their prospective for collaborations and growth, as many workstreams can end up becoming underserved.

Suggested improvements

Throughout the interviews, learners, tutors and industry professionals all gave hints and suggestions on what it could be improved in the educational system. Although those are based

on a more subjective perspective, they might still be relevant input as Talentjourney is further developed.

“The curricula is still not flexible enough – students are not interested in some subjects and would like to further explore other areas. They end up losing motivation.” – Tutor, VET school

Although the suggested improvements listed below have varying degrees of difficulty in implementation, they are still coherent with the current limitations of the educational system:

- Internship introduction: providing learners a longer preparation course for the internship, with guidelines, best-practices and a short-training for them to be better aware of what to expect and deliver.
- Interdisciplinarity: supporting learners to take disciplines in different departments and to conduct interdisciplinary projects in order to have a more holistic overview of CDS/IoT in Smart Manufacturing.
- Shadowing: schools and companies to provide more shadowing opportunities (follow an expert) to students in different moments of their learning journey.
- Sharing of tutors’ best practices: framework to help tutors to learn from each other (both between school tutors and between company and school tutors), with time investment on establishing best practices by observing other tutors, sharing learnings and experiences, and trying new techniques.
- Life skills and knowledge: provision of more than just technical knowledge, but also knowledge on how to live in society, how to make decisions, how to do taxes, how to get back loans, etc.

- Sharing of matrix of competences: schools and companies to share an overview of competencies that are needed in the industry, as well as collaborate to tackle those. This could also be applied in life-long learning for professionals.



Industry

In the search for talent to foster development

"Many times the students are not enough prepared to go to a company and add value – a better knowledge foundation is needed." - Company, Finland

A few SMEs and large enterprises were interviewed for the project. Although companies are the main industry representatives (and therefore, the most interviewed stakeholder in this context), many other institutions take part in the dynamic structure that regulates, certifies and develops the market for CDS/IoT in Smart Manufacturing. As a key economic force, it is utterly important to understand and ensure their needs/challenges will be considered throughout the development of Talentjourney.

Context

Similar to the 'context' insights for the 'education' section, the insights provided in this part do not have the ambition to refer to all processes that happen within the complex system in which companies and other industry

stakeholders are part of. The main objective is to gather relevant aspects that relate to education and that should be considered in the development of Talentjourney.

"Regulation can further accelerate the industry growth and help it evolve in different areas. For example, there is the now the requirement in the EU for water meters to be read remotely" - Company, Italy

The main insights in the industry context are the following:

- Different industries and organizations are at different stages in CDS/IoT for Smart Manufacturing – some of them only use/apply these technologies, while others also develop them. Developing these technologies helps organizations to advance the knowledge in their region and increases their influence on a global level, exporting more of their services (e.g.: IT solutions). They become strategic stakeholders, more able to decide the future of the industry.
- As many SMEs in the field focus specifically on their technical offerings, they lack expertise in other essential areas, such as marketing, sales and business strategy – support is then mostly ad-hoc. Innovation is also highly technically-driven, lacking valuable input and initiative from other departments/disciplines.
- There is increasing potential in the future on the application of IoT solution in B2C markets or other areas (such as retail). However, there is still lack of expertise and visioning in that area – the focus is still centralised on industrial B2B provision.
- SMEs striving for digitalisation have a diffused perspective on the field; not being always able to have a good overview of areas in which they can advance. Interest is growing in areas that are better advertised, such as robotics, IoT, cloud, big data, 3D printing.
- The European market can be more accessible for the industry because of common regulation – standardization is usually first established in the EU before aligning it with other economic blocs/countries/etc.
- Areas such as marketing and sales should be thoroughly considered – they need local presence and also retain a lot of knowledge on consumer demands and on the market for the industry, especially on an international context.
- Although sustainability is considered a critical topic, for the most part the industry doesn't prioritise it, with efforts in the area being mostly incremental, seeking for optimisation (and mostly concerning only the environment dimension).

- Many companies expressed that a good collaboration is based on long-term partnerships. At the beginning, it is needed to connect the right people (company to stakeholder) and communicate/ensure the value for the collaboration.
- Besides pushing companies to adapt fast to remote working, COVID-19 also helped to raise and increase their attention towards technology.

Challenges

Although there might be specific challenges for SMEs or large enterprises, most of the relevant insights showcase aspects that are common to all, as they relate to the overall context of the industry. Standardisation, the fast development of new technologies, the complexity of the

industry and the provision of workforce set the circumstances for the challenges identified. Companies also want to find pathways to develop new business models that integrates the technologies they have been investing in.

“We need to educate new employees internally, which can be time consuming and costly. Our processes are quite complex and it is difficult to find a well-rounded professional who can immediately respond to our needs.” – Company, Slovenia

In connection to the reasons described above, the main insights below provide a more detailed description on the topic:

- The automation industry lacks standardisation on an EU and on a global level. There is the need for a plug-and-play system, a common platform to develop personalised solutions. Different devices and machines operate in different languages, making it difficult to oversee the entire chain and to communicate with different suppliers/stakeholders.
- In order to fully automate a production line one needs a holistic view of different fields of knowledge (such as mechanics of the machine, control of the electronics, informatics data, etc.), therefore it is a challenge for a company to find a well-rounded professional (especially considering how education is often still segmented).
- Micro and small enterprises that need to integrate digitalization/automation have concerns regarding high investment costs in machinery and infrastructure, especially considering their lack of knowledge in the area. At the same time, these small organizations often perceive training as secondary, not giving it enough importance as their regular business activities.
- As technologies are evolving fast, the innovation process and product/service offerings in companies also need to keep up with the pace and the customer requests. The lack of standardisation (e.g.: a plug-and-play system for different machinery), the growing need for industry regulation (e.g.: EU demand for water meters to be read/managed remotely) and product

certification/compliance (e.g.: water meters lab certification), as well as internal professional/expertise development are all time-consuming factors that adds up to the challenge.

- Senior professionals with knowledge in different areas and disciplines are in high demand; as they are difficult to recruit, many companies decide investing on their professionals education. It is more challenging with students, as many times the professional needs to quickly adapt and function independently.
- It is currently difficult to attract talent and recruit professionals to remote areas, further from big metropolises, even when the official language in a given organisation is English. As the costs of living tend to be lower, the financial compensation also suffers some variations. The increasing introduction of adaptive ways of working and remote work might have positive effects on this challenge in the future.



Regional aspects

*Understanding
local contexts to
drive excellence*

“As there is high competition in our region for our industry, It is often important to seek international training and collaboration.” - Company, Slovenia

Insights that differ per region were identified and divided into four different categories. Due to the fact that more stakeholders from some specific regions were interviewed, there were varying levels of information received and analysed for each of them.

Education

Each country has their own approach on education, with different mechanisms and

varying degrees of freedom for schools to adapt their curricula to industry needs and to innovate.

"As we encourage the ministry to become more open for new programs, we need to promote new professions among young people; and in that way encourage society, parents and schools to look into new areas of education." – CPI, Slovenia

Please note that the insights described below for each region were the most prominent expressed in the interviews:

- **Estonia:** After being reduced to 3 years, in 2017 curricula for VET education was re-extended to 4 years. It was recognized that an extra year can be important for the maturation of students and to help them with the social skills. Through collaboration with IPC (an U.S. American association connecting and supporting electronics industries), VET providers can use their resources as a reference to improve their labs and train tutors; with the aim to offer trainings and certifications to the industry. This helps them connect to the industry and also respond to their needs.
- **Finland:** the Finnish educational policy is characterised by the decentralisation in decision-making. Although VET providers have considerable freedom to focus education and training according to local and regional needs, they still need to follow a national core curricula with specific criteria. For example, conducting emulations (related to computing) in real work environments is one aspect that schools need to comply to.
- **Italy:** there is the reflection whether EU regulation of school activities, safety-wise, is uniform all over the Union; as well as if there is the need to be addressed by the EU commission or the EU parliament to help VET be more efficient. Overall, there is a strong desire to innovate, which seems to be carried out well in the industry, within an entrepreneurial environment. As for CDS/IoT in Smart Manufacturing, schools usually relate the area/industry to the electric department.
- **Slovenia:** 80% of the curricula is tied to the national base, while the other 20% is open curricula. The open curricula should allow each school to better provide the needs of the local industry and environment – however, it only addresses content within given subjects (which are already offered in the 80% of curricula).

Industry

Although there are similarities regarding challenges and needs concerning the industry in CDS/IoT in Smart Manufacturing, each region has their own historical context, focus and

maturity level. These aspects help shape unique regional characteristics and create a more diversified context for the industry EU-wide.

“Although the industry is rapidly becoming more automated, the overall mindset still needs to evolve at the pace it advances. Many companies still have the focus of doing things manually, not only in manufacturing, but also in regular office work.” - Tutor, VET school

The following insights help to expand the points above:

- **Estonia:** Estonia is an industrialised country highly dependent on export. Their stakeholders in industries such as IT, industrial engineering, and electronics are very well-connected, and trying to move towards an alignment with IPC standards. Estonia can be characterised by having strong industrial IT solutions offerings; small specialised companies using AI and automation; and a very advanced forestry industry with modern machinery.
- **Finland:** Finland companies in the region of Satakunta operate in subcontracting chains and in the international market. Internationalisation is a priority for the country, and they focus on developing strong international connections. Although they are relevant players in the industry, they could still have more international recognition.
- **Northeast Italy:** Italy has a diverse industry. The region of Veneto is very industrialised and known to be highly entrepreneurial, with big organisations and also several micro and SMEs, either operating on a more traditional industry (focusing on “made in Italy” products) or on a highly innovative one (start-ups). Taking into consideration the local culture and needs, the industry is putting efforts in undertaking digital transformation and implementing automation where possible – but there is gap between their desire to advance and their knowledge/means. SMEs don’t know quite yet how to start when adopting new technologies/digitalization, relying mostly on consultants; and many of their decisions are taken by ‘word of mouth’ and recommendation. Because there is a shortage of digital experts in the market, companies cannot always find the right people to hire. As a way to recruit and retain knowledge, many SMEs are increasingly relying on internships – this is also a governmental strategy to further embed digitalization in organisations. Another aspect can be related to funding: SMEs either look for funding opportunities for a specific initiative; or decide to invest/become interested in a particular initiative because of the funding. However, many companies don’t invest time in them because they expect the process to be time-consuming and bureaucratic.

- **Slovenia:** The Slovenian industry is rapidly developing, even though a considerable part of it is still composed of suppliers for other countries/industries, such as the German automotive industry. However, the country is also trying to take the lead with their own large organisations (e.g.: Gorenje, Adria Mobil) and SMEs (there are a lot of small entrepreneurs who try to find a niche in the market). The development of CDS/IoT in Smart Manufacturing in Slovenia is mostly led by large companies or small local producers, highly specialized and advanced. Many companies, however, face a challenge when trying acquiring competencies in specific given disciplines (e.g.: functional safety). Due to high competition, it is difficult to find other organisations or professionals willing to share 'niche' knowledge in Slovenia; therefore, international collaborations play an important role to cover this gap.

Collaboration

Collaboration between stakeholders in each region is highly subject to local policies, practices and needs. In some countries/regions, universities and research centres play a bigger role in the industry, while in others there is still

the need to strengthen the collaboration. The presence and influence of regional authorities and chambers in the industry also varies per country.

"For more successful collaboration, the stakeholders should know who is the person to contact – many times they don't know with whom they should connect with. It is also important to communicate and increase awareness of the value for the collaboration right from the beginning." – Consultant, Italy

In connection to the reasons described above, the following insights provide a more detailed description on the topic:

- **Estonia:** The stakeholders in Estonia in the area of electronics and smart factories have high collaboration and awareness of each other, and many adopt IPC standards to further connect the industry. Schools support their local factories by providing certified training. In recent years, many research centres in Estonia became part of universities; however, scientific R&D in Estonia in some areas is not aligned with the interests and needs of the industry.
- **Finland:** in Western Finland, companies have close cooperation with research centres and universities due to the fact that they market their services for the tech industry. Usually, consultants certified by authorities provide trainings to companies on specific topics. Regional authorities play an active role in the local industry, as there is not only high investment from their

side (especially from the regional development organization), but as they can also be customers of some companies.

- **Northeast Italy:** SMEs usually look for consultants recommended via word-of-mouth or previous experience to take a first step in digitalization/technology. The Chamber of Commerce is one of the stakeholders who offer funding opportunities. Collaboration between companies and more ‘traditional institutions’ (such as research centres) is not so strong: companies don’t know exactly with whom to interact in the institution – it is difficult for them to find the right person to address their problem; another issue is that companies sometimes think these stakeholders cannot add much value compared to the effort needed to establish a collaboration; it also happens that priorities are different – many companies need flexible partners who can deal with time pressure and other industry demands. In the case of SMEs, the owner has a considerable influence in the company’s partnerships: a lot is decided by peer recommendation, and collaboration is also not sought with a stakeholder if they were not a part of the entrepreneur’s learning journey/career (e.g.: university).
- **Slovenia:** In Slovenia, chambers (such as the ones associated with engineering) play an important role for companies on providing trainings and certifications to comply with regulations; they also provide some technical support. The cooperation with the chambers is more formal as there is a law for engineers to join 2-3 trainings per year; and although useful, all of the papers required for it can be somehow time consuming.

Ambition level

Although many principles for development are similar, it is important to understand the ambition for each region considering their

particular regional aspects, and fully integrating economic, social and environmental aspects.

"It is important to grow from technology adopter to technology provider. The countries who are ahead are the ones who are developing technology and applying them." – VET provider, Estonia

Please note that although the points below were some of the ambitions mentioned by interviewees, they cannot be considered hard facts, but rather one of the many perspectives regarding the potential direction for each region:

- **Estonia:** Although it is already happening in some areas (such as IT), Estonian interviewees recognised the need to progressively transition from IoT user to IoT developer, becoming then an international reference point for the industry.

- **Finland:** more international visibility and recognition and the progressive integration of IoT with sustainability, considering its application on a social level and on healthcare to attend national objectives.
- **Northeast Italy:** Some of the ambitions expressed for Northeast Italy concerns more international collaboration and develop the industry through digital transformation, supporting the transition of traditional, well-established organisations; and the establishment of new ones. There are also efforts in the integration of IoT with sustainability (e.g.: smart building).
- **Slovenia:** Slovenian interviewees all mentioned the overall ambition to consolidate their industry development, moving from supplier to OEM. Regions and their respective authorities/governments have also expressed the ambition to establish smart ‘greener’ cities; and to further develop a circular economy.

International context

There were many aspects mentioned regarding internationalisation, mobility, collaboration and economy. Each region raised different topics that

together, helped understand a bit better their international context.

“International collaboration can be many times a “serendipity process” – it happens by chance. Sometimes SMEs look for it – it is easier when the entrepreneur already has international experience. Actually, the difference between advanced companies and companies that are falling behind are many times due to the entrepreneur’s mindset.” – Consultant, Italy

The following insights help to expand the points above:

- **Estonia:** about 75% of Estonian export is related to the industrial sector, and a quarter of that is related to the electronics industry; as the local market is small, Estonia is highly dependent on export. Because workforce is progressively becoming expensive, the country cannot compete on cost; therefore it needs to compete on quality and technology offerings.
- **Finland:** beyond international cooperation on an industry level, Finland has strong international cooperation for mobility and research. Besides that, around 10% of international students in the VET system are people who first come to the country to learn the language and then decide to stay further and fully establish themselves there. International collaborations and partnerships might be more difficult to build, as the Finnish organisations tend to need time to establish fluid communication channels and platforms.

- **Northeast Italy:** Northeast Italy has different cooperation projects for digital transformation/innovation hubs on an EU level, with the intent to improve and strengthen their EU-wide ecosystem, and influence smart specialization strategies considering market needs. They have collaborations on the fields of digital transformation, sustainable tools, energy efficiency (smart building). Internationalization and mobility still has space to grow in VET. As for international collaboration, it is easier for SMEs to actively look for it when the owner has a more open, international mindset, willing to take risks. experience. Sometimes, this is the difference between advanced companies and companies that are falling behind. Overall, the Veneto region supports internships in SMEs with learners at an university level, in order to foster knowledge in the company and introduce digitalization/technology in a smooth way.
- **Slovenia:** Slovenia attracts some international talent in smart manufacturing, with some international companies and engineers. Along the Italian border, as well as in other areas, there is expressive foreign investment. The current ministry of industry and business seems very open to internationalization - 1.6% of foreign companies that are incorporated in their business system provide 25% of GDP. It is important to note that usually in more remote regions, human resources can comprise a challenge, with local workforce moving to Ljubljana and abroad due to economic reasons. As for collaboration, companies look for trainings from international manufacturers/producers to get specific expertise.



Input for Talentjourney

Better project partnership and development

“We need to have a sustainable ecosystem with partners in the economy, abroad, in our local environment to get knowledge and information on how to develop and where to develop; and have this knowledge transferred to all stakeholders.” - VET school, Slovenia

In order to understand the expectations for Talentjourney, as well as understand what factors are essential for the success of the partnership, partners interviewed were asked to provide their perspective and mention the most relevant points for them.

Expectations for Talentjourney

As there are different types of stakeholder and regions involved in the partnership for Talentjourney, it was considered of high importance to ask their expectations on it. This is

also helpful to ensure there is an alignment and understanding throughout the project development.

“The topic of IOT in the educational sector, especially in the VET sector, is still quite new. That is why we are looking for experts who can share valuable knowledge in the area. It is also important to share good examples with other VET providers, that is why having these connections is necessary.” – VET school, Slovenia

The aspects below were the most mentioned by partners on what they anticipate the partnership and platform to deliver:

- Help the education system to become more learner-oriented by bringing different approaches for digital transformation in education
- Create an ecosystem that connects VET providers with experts to exchange knowledge and experience; as well as to further advance the knowledge within CDS/IoT in Smart Manufacturing.
- Provide direction for different stakeholders on how to develop and in which areas to develop; and ensure they are all aligned and connected, on a regional and international level.
- Support and further develop education to better follow the trends and the requirements of the labour market; and have a good overview on skill, competence and knowledge gaps and industry needs in Europe, supporting research in the area
- Support the creation of a school environment that actively includes their partners (.e.g.: companies, technological parks, research labs) and connects them to their learners; so they can apply their knowledge; discover their talent; and develop in different directions.
- Create an open and engaging virtual platform to make knowledge in the field more accessible, autonomous and collaborative – not only for learners, but also for partners.
- Increase interest in the area in order to recruit new students and workforce; as well as promote schools to help them get more funding for labs and initiatives regarding CDS/IoT in Smart Manufacturing and digitalization
- Align different stakeholders (companies, learners, tutors, etc.) to address real and tangible problems in regions/EU while fully considering the economical perspective.
- Increase mobility between teachers, students, companies and labs, improving regional and international collaboration.
- Increase general awareness on CDS/IoT in Smart Manufacturing, new technologies, user-centred learning and innovation to encourage learners, families, institutions, authorities and society to

become more open for new programs, to look into new areas of education, and to promote new professions among young people.

Success factors for Talentjourney

Similar to the expectations for Talentjourney, partners were also asked on the points they find

critical for the success of the partnership and for the project development.

“Schools need to develop and use solutions based on what the industry has already developed, instead of further increasing the distance from them.” – VET provider, Estonia

According to partners, the aspects below are crucial to drive the Talentjourney project forward, and also to help the platform succeed during and after implementation:

- Clearly defined roles and goals for each partner involved, with measurable and concrete targets
- Reliability and commitment from all partners
- Have a medium and long-term planning
- Adjust to the platforms, systems, standards and criteria that are already being used by the industry
- Have a good flow of information, sharing knowledge and relevant data on the field
- Have effective articulation of the needs, expectations and priorities of each partner/stakeholder
- Ensure the human connection behind the collaboration
- Have policies/overall alignment for allocating resources
- Stay attentive to changes in the economy.

Conclusion

The interviews and insights are key to kick-off the WP5 activities and shape its deliverables. It is through a systemic understanding that one can start identifying pathways to achieve the Talentjourney ambition.

The insights generated from the interviews not only showcase some of the challenges, needs and opportunities that should be considered throughout the development of Talentjourney, but also expand the perspective on why and how these happen. This systemic understanding, which considers the stakeholders involved and the interactions that occur between them, is key for the implementation of strategies that cause relevant and long-lasting impact on VET education, on the industry and on the learner.

In terms of application, the findings disclosed in this document should be considered not only for the development of the WP5 deliverables, but also shared with partners for the other workstreams. As these insights are key to bridge the activities conducted in other WPs, as well as to find different problem-solving routes; there should be an agreement between partners on their relevance and application.

All WP5 deliverables lead towards the creation of a service blueprint, whose main goal is envisioning the Talentjourney platform. Therefore, it is clear that the interviews and generated insights are essential for the start of the workstream activities. By further revealing the interactions and interdependence between stakeholders in these complex ecosystems; they provide valuable input on what are the gaps and how to address them to reach the overall ambition for Talentjourney.

Appendix

- Questionnaire for partners
- Questionnaire for companies
- Questionnaire for tutors
- Questionnaire for learners

Questionnaire for partners

PARK introduction (5 minutes)

Objective: Make sure partner understands the interview objectives and has a clear overview of WP5 deliverables

1. PARK to introduce themselves and to explain:
 - a. WP5 project planning
 - b. WP5 deliverables
 - c. Interview objectives
 - d. Interview structure
 - e. How the information collected is going to be used

Partner introduction (8 minutes)

Objective: Get an overview of partner organization (supports creation of B2B personas)

2. Please give a brief introduction of yourself and your organization.
3. What are the three main services provided by your organization?
4. What types of jobs and roles are relevant for your organization?
5. Please describe briefly your organization's role and motivation for the Talentjourney project.

Organization (15 minutes)

Objective: Gather information to start empathizing with the stakeholder and map their profile (supports creation of B2B personas)

6. What does Connectivity Devices and Services/CDS (IOT in smart manufacturing) mean to your organization?
7. What is your organization main objective/goal regarding CDS (IOT in smart manufacturing)?
8. Considering that objective, please answer for your organization the top three:
 - a. Strengths
 - b. Gaps/needs
 - c. Challenges
 - d. Opportunities
9. What would be the main benefit of the Talentjourney platform for your organization?
10. What is the greatest strength and value you would bring to the Talentjourney platform?

Regional context (15 minutes)

Objective: Map the region profile (supports creation of regional ecosystem map)

11. How is CDS (IOT in smart manufacturing) relevant to your region?
12. How would you rate the maturity of the CDS (IOT in smart manufacturing) sector within your region?
Why? (Please consider scale below)
 - 1) Not well-established: region lacks resources and competencies, and also fails to understand the value
 - 2) In development: region recognizes the value but still lacks resources and competencies
 - 3) Well-established: region has resources and competencies but lacks international visibility and cooperation
 - 4) Role model: Region is a champion for IoT in Smart Manufacturing, having international recognition and cooperation
13. Considering the answer before, what is the current status quo of VET in CDS (IOT in smart manufacturing) in your region?
14. Is your region behind or ahead of the rest of Europe in VET in CDS (IOT in smart manufacturing)? Why?
15. What would you claim to be the main goal/objective for the CDS (IOT in smart manufacturing) sector for your region?
16. Considering your own experience regarding the CDS (IOT in smart manufacturing) sector in your region, please point out the top three:
 - a. Strengths
 - b. Gaps/needs
 - c. Challenges
 - d. Opportunities

Stakeholders and collaboration (15 minutes)

Objective: Understand and map the regional ecosystem (supports creation of regional ecosystem map)

17. You've sent a list with the key stakeholders for your region. With whom does your organization already collaborate?
18. With which stakeholders would you like to collaborate more? Why?
19. From the stakeholder category list, please rank them in order of collaboration (from who you collaborate the most with, to whom you collaborate the least with). Feel free to add any new categories you find important.

- Learners
 - VET providers
 - Employers
 - Associations of sectors
 - Regional authorities
 - Research centres
 - Chambers
 - Technological parks/incubators
 - Universities of applied sciences
20. Regarding the collaboration, please summarize in a couple of sentences for the top three stakeholders:
- a. The overall goal/objective
 - b. Their role and your role
 - c. The top three aspects that work well
 - d. The top 3 challenges
21. What do you see as the critical factors to ensure successful collaboration and actionable results?

EU context (15 minutes)

Objective: Understand and map the EU ecosystem (supports creation of EU ecosystem map)

22. What are your organization international strategies? (e.g.: mobility charter)
23. With which other regions/EU level organizations does your organization have strong collaboration/connection with?
24. What role do you play in this collaboration? What about them?
25. Considering your experience when collaborating at an EU level, please point out the top three:
- a. Strengths
 - b. Gaps/needs
 - c. Challenges
 - d. Opportunities
26. Considering VET excellence in CDS (IoT in Smart Manufacturing), what do you see as main the potential of your region for the EU?

Ending (8 minutes)

Objective: Identify stakeholders to further interview and finalize interview.

27. Are there any learners and tutors in your organization we can connect with to interview?

28. From the stakeholders (organizations) you collaborate with, are there any important ones you would recommend us to interview?
29. Is there anything you would like to add to this interview?
30. PARK to briefly recap:
 - a. How the information collected is going to be used
 - b. What will be done with the interview input, as well as the expected involvement of the partner with WP5 in the future

Questionnaire for companies

PARK introduction (6minutes)

Objective: Make sure partner understands the interview objectives and has a clear overview of WP5 deliverables

1. PARK to introduce themselves and to explain:
 - a. WP5 project planning
 - b. WP5 deliverables
 - c. Interview objectives
 - d. Interview structure
 - e. How the information collected is going to be used

Partner introduction (10 minutes)

Objective: Get an overview of partner organization (supports creation of B2B personas)

2. Please give a brief introduction of yourself and your organization.
3. What are the three main services provided by your organization?
4. What types of jobs and roles are relevant for your organization?

Organization (15 minutes)

Objective: Gather information to start empathizing with the stakeholder and map their profile (supports creation of B2B personas)

5. What does Connectivity Devices and Services/CDS (IOT in smart manufacturing) mean to your organization?
6. What is your organization main objective/goal regarding CDS (IOT in smart manufacturing)?
7. Considering that objective, please answer for your organization the top three:
 - a. Strengths
 - b. Gaps/needs
 - c. Challenges
 - d. Opportunities
8. What would be the main benefit of the Talentjourney platform for your organization?
9. What would be the greatest strength and value you could bring to the Talentjourney platform?

Regional context (15 minutes)

Objective: Map the region profile (supports creation of regional ecosystem map)

10. How is CDS (IOT in smart manufacturing) relevant to your region?
11. How would you rate the maturity of the CDS (IOT in smart manufacturing) sector within your region?
Why? (Please consider scale below)
 - 1) Not well-established: region lacks resources and competencies, and also fails to understand the value
 - 2) In development: region recognizes the value but still lacks resources and competencies
 - 3) Well-established: region has resources and competencies but lacks international visibility and cooperation
 - 4) Role model: Region is a champion for IoT in Smart Manufacturing, having international recognition and cooperation
12. Considering the answer before, what is the current status quo of VET in CDS (IOT in smart manufacturing) in your region?
13. Is your region behind or ahead of the rest of Europe in VET in CDS (IOT in smart manufacturing)? Why?
14. What would you claim to be the main goal/objective for the CDS (IOT in smart manufacturing) sector for your region?
15. Considering your own experience regarding the CDS (IOT in smart manufacturing) sector in your region, please point out the top three:
 - a. Strengths
 - b. Gaps/needs
 - c. Challenges
 - d. Opportunities

Stakeholders and collaboration (15 minutes)

Objective: Understand and map the regional ecosystem (supports creation of regional ecosystem map)

16. Considering the following stakeholder category list, please rank them in order of collaboration (from who you collaborate the most with, to whom you collaborate the least with). Feel free to add any new categories you find important.
 - Learners
 - VET providers
 - Employers
 - Associations of sectors
 - Regional authorities
 - Research centres
 - Chambers

- Technological parks/incubators
 - Universities of applied sciences
17. Who are some of the stakeholders in the category you collaborate the most with?
 18. With which stakeholders would you like to collaborate more? Why?
 19. Regarding the collaboration, please summarize in a couple of sentences for the top three stakeholders:
 - a. The overall goal/objective
 - b. Their role and your role
 - c. The top three aspects that work well
 - d. The top 3 challenges
 20. What do you see as the critical factors to ensure successful collaboration and actionable results?

EU context (15 minutes)

Objective: Understand and map the EU ecosystem (supports creation of EU ecosystem map)

21. What are your organization international strategies?
22. With which other regions/EU level organizations does your organization have strong collaboration/connection with?
23. What role do you play in this collaboration? What about them?
24. Considering your experience when collaborating at an EU level, please point out the top three:
 - a. Strengths
 - b. Gaps/needs
 - c. Challenges
 - d. Opportunities
25. Considering VET excellence in CDS (IoT in Smart Manufacturing), what do you see as main the potential of your region for the EU?

Ending (5 minutes)

Objective: Identify stakeholders to further interview and finalize interview.

26. From the stakeholders (organizations) you collaborate with, are there any important ones you would recommend us to interview?
27. 27. Is there anything you would like to add to this interview?
28. Is there anything you would like to add to this interview?
29. PARK to briefly recap:
 - c. How the information collected is going to be used
 - d. What will be done with the interview input, as well as the expected involvement of the partner with WP5 in the future

Questionnaire for tutors

1. PARK to introduce themselves and to explain:
 - a. The Talentjourney project
 - b. Interview objectives and structure
 - c. How the information collected is going to be used

2. Tutor introduction:
 - a. Name, age, nationality
 - b. Field of expertise
 - c. Teaching context: students, school, years of experience

3. Do you have experience in the industry (working at a company)? How did you become a teacher?

4. What is your motivation for teaching?

5. What are your main objectives as a teacher? (Please differ between your own objectives and the school/institutional objectives).

6. In regards to CDS/IoT in Smart Manufacturing, please answer:
 - a. What knowledge/experience do you consider important for students to acquire?
 - b. How do maintain yourself up-to-date with changes and developments in the field?
 - c. How do you ensure to also update your students regarding these developments?

7. What are the main gaps you identify in your students in terms of skills and competencies?

8. Regarding to students professional experience (apprenticeship, in-job training, or any practical application of knowledge in company), please answer:

- a. How do you prepare and support students for their professional experience?
 - b. How do you evaluate the students professional experience once they finish?
9. Regarding teaching methods and learning methods, please answer:
- a. What teaching methods have you found to be most effective? And the least? Why?
 - b. What are the new innovative ways for learning being sought by students? (e.g.: online classes, youtube, videogames, etc.)
 - c. How do you keep yourself up-to-date with these new innovative ways for learning?
10. With the advancements in technology and on learning methods, how do you believe the role of the tutor has changed/evolved? What do you believe your role will be in the future? (e.g.: teacher vs tutor - only providing knowledge in classroom vs being a coach for students)
11. What are the biggest gaps you currently identify in the educational system?
12. What are the three main aspects you would change/improve in the educational system?
13. Is there anything else you would like to add?

Questionnaire for learners

1. PARK to introduce themselves and to explain:
 - a. The Talentjourney project
 - b. Interview objectives and structure
 - c. How the information collected is going to be used

2. Learner introduction:
 - a. Name, age, nationality
 - b. Personal life: family, interests, hobbies
 - c. Field of study: currently and (if applicable) previous degrees
 - d. Education experience: formal, life-long learning, professional experience

3. What are your goals for your future career?

4. Describe your learning journey (please consider the following steps as a reference):
 - 1) Exploration (awareness/need) (e.g.: discovering field of study; identifying gap in knowledge or certification)
 - 2) Looking for information and quality (e.g.: on field of study; certification; schools and providers)
 - 3) Making a decision and applying (e.g.: for this field of study; to seek further education; on a school or provider)
 - 4) Learning process “in school” (e.g.: theory; projects; labs; duration)
 - 5) Work experience (e.g.: work-based learning, on the job training, apprenticeship; internships; application of knowledge in job/company)
 - 6) Self-learning experience (at home, with friends, internet – innovative ways of delivering and gaining knowledge)
 - 7) End of studies (e.g.: market placement)
 - 8) Evaluation/reflection (e.g.: life-long learning process)

5. Are there any steps you would add/take away?
6. What were/are the most enjoyable aspects in your learning journey?
7. What were/are your biggest challenges in your learning journey?
8. What are three main aspects you wish could be improved in your learning journey?
9. Is there anything else you would like to add?