



investment plan

Tartu City Government

01.09.2022



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SECTION 1: THE POLICY CONTEXT

1.1. Needs analysis in the territorial context

In the context of the fourth industrial revolution – Industry 4.0 – there has been an exponential growth of digital tools, including robots, cobots, connected objects, communication systems, data centres, and associated energy consumption. The manufacturing sector is seizing the potential of these new technologies and integrating them into their production processes to improve the efficiency of their operations. Indeed, the European Commission **recognises advanced manufacturing as a key enabler that will increase industrial competitiveness, sustainable growth, job creation, and improve societal well-being**¹.

Digitalizing the manufacturing sector has several societal, environmental, and economic benefits. These include new operational structures that improve production processes' efficiency, sustainable manufacturing by reducing waste, material, and energy consumption, and increased innovation via enhanced data flows, which fosters data sharing and collaboration². However, a significant challenge is understanding and promoting the right combination of competencies and skills to power industry 4.0. **This makes the issue of upskilling and reskilling a qualified workforce critical for developing a modern industrial and manufacturing sector.**

On human capital, Estonia has the relevant prerequisites for a smart and digitally adept workforce. With 62% of Estonians having at least basic digital skills, people in Estonia can benefit from increasingly digitalised government services and digital services more generally. Estonia also performs well on advanced digital skills compared to other EU countries. In 2020, ICT specialists accounted for 6.5% of the employed population (EU 4.3%) and ICT graduates represented 8% of total graduates in 2019, significantly above the EU average of 3.9%. **However, according to the EU's yearly Digital Economy and Society Index (DESI) 2021, Estonia was 7th in the overall EU score in 2020 and still has some work to do on digitalising its industry. Only 17% of Estonian companies provided ICT training to their employees in 2020, below the EU average of 20%.**

In a similar vein, Estonia lacks 2/3 of the engineers needed in the manufacturing industry. This challenge is exacerbated by the fact that the number of higher education admissions for manufacturing and engineering programmes in production and processing has decreased by half in the last six academic years.³ **In short, there is a need for innovative engineers who can adapt to the constantly changing manufacturing landscape - be it the use of robots, the green and digital revolution, or innovative product development projects.**

These national challenges are also felt at the city level in Tartu – Estonia's second largest city. Tartu has the necessary institutions, student population, and manufacturing companies to provide a supportive environment for industry 4.0 employees and companies. However, **there is a mismatch between the labour market and the needs of manufacturing companies in Tartu – where there is a shortage of skilled engineers**

¹ European Commission, Executive Agency for Small and Medium-sized Enterprises (2020), *Skills for industry curriculum guidelines 4.0 : future-proof education and training for manufacturing in Europe: final report*, Publications Office, <https://data.europa.eu/doi/10.2826/097323>

² Josélia Elvira Teixeira, Ana Teresa C.P. Tavares-Lehmann (2022) *Industry 4.0 in the European union: Policies and national strategies, Technological Forecasting and Social Change*, Volume 180, <https://doi.org/10.1016/j.techfore.2022.121664>

³ Rain Leoma, Ave Ungro (2021) *OSKA raport "Töötlev tööstus"*, <https://oska.kutsekoda.ee/uuring/tootlev-toostus/>

and young talent who have the required skills to work for the 1,278 manufacturing companies located in Tartu County. This is detrimental because:

- Manufacturing companies will have a difficult time finding and retaining skilled workers;
- The competitiveness of manufacturing companies will decrease if they cannot find the right talent to drive innovation within the company;
- Scaling to new markets will be difficult if manufacturing companies are unable to hire new workers;
- For the City of Tartu, students may look to other cities or even countries for jobs when they might be able to find a better match in Tartu;
- The overall competitiveness of Tartu and Estonia for advanced manufacturing and industry 4.0 jobs will be limited compared to other regions in Europe.

There are several challenges that prevent the manufacturing sector from reaching its full potential:

1. There is a lack of people with skills in industrial engineering, mechanics, operating machines and ICT systems development, analysis, management, etc. Vocational training and the development of master's skills in technical fields are becoming increasingly important for companies and the workforce they need. Companies need entry-level students/trainees/workers who grow within a company to one day become an expert
2. There is a gap between education and industry. There is a need to focus on educational topics that consider the future of entrepreneurship and the challenges employers face today.
3. Vocational secondary education graduates do not continue their education
4. The currently existing vocational education programs have not been effective. The mismatch between the labour market and manufacturing companies is further exacerbated by the fact that current apprenticeship programmes are more used as "life-long learning" programmes.

The challenges described above require an integrated solution where all major stakeholders in Tartu's manufacturing sector can come together, find a common solution, and develop a programme that suits all their needs.

1.2. The policy response

There are several EU, national, and regional level strategy documents which stress the importance of skilled personnel and the need to increase the added value of the industrial sector significantly. Table 1 maps these different strategic goals and their main linkages to this investment plan.

Table 1. Relevant strategic documents and policies

Strategic document	Relevant links to the current IP
EU level strategic priorities	
Europe's Digital Decade: digital targets for 2030	On 9 March 2021, the European Commission presented a vision and avenues for Europe's digital transformation by 2030. As a part of this policy, the EC defines the « Digital compass » which sets out the digital ambitions for Europe for the next decade. These objectives include: <ol style="list-style-type: none"> 1. a digitally skilled population and highly skilled digital professionals; 2. secure and sustainable digital infrastructures; 3. digital transformation of businesses;

	4. digitalisation of public services.
A New Industrial Strategy for Europe	<p>The new Industrial Strategy for Europe will lead the twin green and digital transitions and will make European companies more competitive. One of its core ambitions is to shape an industry that is anchored in advanced, digital tools. To be competitive, the current strategy document highlights the need for a:</p> <p><i>«...robust industrial base, high quality research, skilled workers, a vibrant start-up ecosystem, mature infrastructure, and a leading position in the use of industrial data. »</i></p> <p>Furthermore, one of the core tenants of this policy is the skilling and reskilling of workers. Indeed, the strategy document cites the need for recruiting and retaining a qualified workforce which will require education and training programmes. It is also worth mentioning that the strategy document prioritises the need to have a better balance between women and men in industry. This could be particularly useful for areas where there is a high demand for skill workers but not enough supply.</p>
National level policies	
Estonian Education strategy 2021–2035	<p>The general objective of this strategy is to:</p> <p><i>«To equip the population of Estonia with the knowledge, skills and attitudes that prepare people to fulfil their potential in personal, occupational and social life and contribute to promoting the quality of life in Estonia as well as global sustainable development. »</i></p> <p>The most relevant to the current IP is sub-objective 3, which aims to provide lifelong learning opportunities – including the skilling and reskilling of workers – to match the needs of the labour market.</p>
Estonian Research and Development, Innovation and Entrepreneurship Strategy 2021–2035	<p>General aim is that Estonian research, development, innovation, and entrepreneurship work together to increase the well-being of Estonian society and the productivity of the Estonian economy, by providing competitive and sustainable solutions for the development needs of Estonia and the world.</p> <p>The sub objective that stands out as relevant to this IP is the business environment objective which encourages entrepreneurship, the growth of knowledge-intensive enterprises, and the creation and export of higher valued products.</p>
Regional level policies	
Tartu 2030 Strategy	<p>The strategy document "Tartu 2030" is a strategic document of city management - a vision and code of conduct shared with the people of Tartu - for all those who care about the well-being of Tartu. One of the core challenges referenced in the document is the need to bolster continuing education and requalification while also actively shaping the labour market to make Tartu companies more competitive.</p>
Tartu Development Plan 2018-2025	<p>The development plan of the city of Tartu contains specific activities for shaping the near future of the city of Tartu. It is based on the long-term vision of the city's development reflected in the strategy Tartu 2030 document.</p>

	Tartu Development Plan, the strategic policy document for Tartu City Government has similar goals which are brought in Estonian Growth Strategy for Entrepreneurship which includes national RIS3 Strategy and its goals. In fact, "Information and communications technology and electronics" is one of the growth areas of the Tartu and South Estonia RIS3.
Smart Tartu Vision	A smart city vision strategy is a forward-looking, clearly structured framework in which each area of a smart city fulfils the overall vision of a smart city. Each area represents the mission, how it will be achieved, and very clear measurable goals, supported by strategic directions and activities under them.

Beyond policy, Tartu has a solid foundation from which to skill and reskill qualified workers for future manufacturing jobs. First, **Tartu Vocational College (VOCO) is the largest centre for vocational and educational training in Estonia.** The vocational school has been working closely with some of Tartu's manufacturing companies to develop a work-based learning system to make the graduates better equipped for the actual needs of the labour market.

Tartu launched a digitalisation voucher scheme in 2019 for local manufacturing companies. This grant has helped manufacturing SMEs improve their warehouse management systems, quality control procedures, customer relationship management, and other services that needed to be digitalised. In 2021 the measure was widened for several service-providing sectors as well. In addition to the digitalisation voucher scheme for manufacturing companies mentioned above, Tartu as a city is also supporting the startup ecosystem via events like the sTARTUp Day festival, industry hackathons, and by supporting incubators.

Tartu City can serve as a uniting force to foster collaboration between public and private institutions with SMEs and other relevant companies. Companies in Tartu are gradually turning towards solutions and cooperation possibilities with HEIs, Industry 4.0 service providers and the local government. The position of the city of Tartu as a bridge between HEIs, service providers, and SMEs/other relevant companies will allow these stakeholders to identify challenges more effectively and co-create solutions to support industrial/manufacturing companies in the Tartu area.

The proposed project aims to **increase the competitiveness of the manufacturing sector** in Tartu through a **dual education training programme** which ensures a qualified workforce that has the tools, methodologies, and competencies necessary to thrive in industry 4.0. The strategy for this project is informed by the lessons learned from the AS Fabrik project and the current challenges that students, manufacturing companies, HIE institutions, and the city of Tartu face.

Taking inspiration from the AS Fabrik project, the city of Tartu recognises that industry 4.0 education and related curriculum for the proposed project needs to be designed keeping the industry and business needs in mind while simultaneously ensuring the mobility and employability of the student. To accommodate the needs of multiple stakeholders, cooperation, collaboration, and communication are paramount to ensuring the achievement of the project's main goal.

The project also takes strategic inspiration from the German dual education system, which combines apprenticeships in a company and vocational education in a classroom setting into one course. Using this approach, the training courses developed in the project will ensure that the students are gaining practical experience in the career of their choice while also learning the theories, tools, and methodologies in a classroom setting.

SECTION 2: THE INVESTMENT PROPOSAL

2.1. Background to the proposal

2.1.1. URBACT-UIA MECHANISM OF AS-TRANSFER

The transfer mechanism is a URBACT method of exchange and learning that has been applied in 2021 to facilitate the experimentation and adaptation of innovative approaches piloted through the Urban Innovative Actions (UIA). AS-Transfer is the UIA-URBACT transfer mechanism that seeks to share the experiences of Bilbao in the AS Fabrik project (UIA) with Bielsko Biala, Tartu, and Timisoara that want to meet the ultimate approaches in the field of the smart specialisation in Industry 4.0 and digital economy.

The methodology relies on the implementation of three distinct steps:

- **Stage 1 – Understanding:** a first 6-month period dedicated to developing a deep and shared understanding of the UIA practice, materialised through the production of a Transferability Plan;
- **Stage 2 – Adapting:** a subsequent 9-month period dedicated to exchanging and learning activities facilitating the adaptation of the UIA practice to the context of Bielsko Biala, Tartu and Timisoara, through the definition of Investment Plans and a Springboard Plan for the Lead Partner Bilbao;
- **Stage 3 – Preparing for reuse:** a last 3-month period dedicated to reviewing Investment Plans and focusing on preparing for future implementation.

2.1.2. AS - FABRIK

AS Fabrik was conceived to increase the competitiveness of the local KIBS sector and prepare them to supply the digital transformation demands of the manufacturing sector (Industry 4.0). AS-Fabrik is based on the premise that the digitalisation of the industry requires new competencies, and hence, education and training are affected. Fresh graduates from universities and other educational institutes must be prepared to work in this new environment, and current staff in companies may need retraining. **All in all, massive educational and training efforts are required to transition to a more digital economy.**

In pursuit of this goal, AS-Fabrik has developed four primary modules:

1. **Forging innovative alliances:** Bringing stakeholders together within the innovation, education, manufacturing sector to facilitate business partnerships and education agreements.
2. **Promote and support start-ups/intrapreneurship:** The start-up boosting process aimed to create new companies or new intra-company ventures in the field of industry 4.0 and advanced business services via an acceleration programme.
3. **Develop education and training programmes:** Develop a training programme for professionals which includes technical courses (on topics such as Data Science, Embedded Systems and Advanced Services Design), and more managerial ones (on servitisation, finance and management). Ten participating companies received an in-company training, dedicated to their needs
4. **Create a building to bring it all together:** Create a centre for industry 4.0 which brings innovators, educators, and other stakeholders in one space where they can explore new partnerships, co-create ideas, and provide training for industry professionals.

Analyses backed up these activities to understand the competitive context in which firms operate, by monitoring activities, and by workshops to identify new business opportunities with the relevant regional players. Also, lessons were drawn from good practices of other city regions where KIBS are being promoted as an input for the design of support measures at the level of Bilbao.

The innovative aspect of AS-Fabrik that stands out is the focus on creating a strategic alliance based on knowledge and innovation that aims to improve the local ecosystems of cities, with city businesses, universities, local service providers and entrepreneurs hosted in a tailor-made innovative space. Through this collaborative effort, AS-Fabrik was able to serve as a lynchpin in their community for driving innovation, growth, and prosperity in Bilbao.

AS-Fabrik is highly relevant for cities around the EU, and particularly for the city of Tartu. Given the strong foundation Tartu has with the HEIs, support from public authorities, and forward-looking and innovative manufacturing companies, the collaborative approach taken in AS-Fabrik could be beneficial for bringing relevant stakeholders to the table in Tartu and driving the manufacturing sector forward.

Of course, adapting the learnings from AS-Fabrik is necessary to fit the local needs and capacity of the city of Tartu. In this context, the city of Tartu is interested in replicating the learnings from the third module of AS-Fabrik (Develop education and training programmes) and focusing on the talent ecosystem, rather than the other three modules. This is because Tartu, and Estonia in general, has strong support measures that can cover the services described in the other modules. In this sense, the AS-Transfer project in Tartu seeks to be a mechanism to upskill and reskill young talent in the Tartu area while also being a resource to connect stakeholders with the information and tools they need to thrive in the manufacturing sector.

AS-Fabrik in numbers

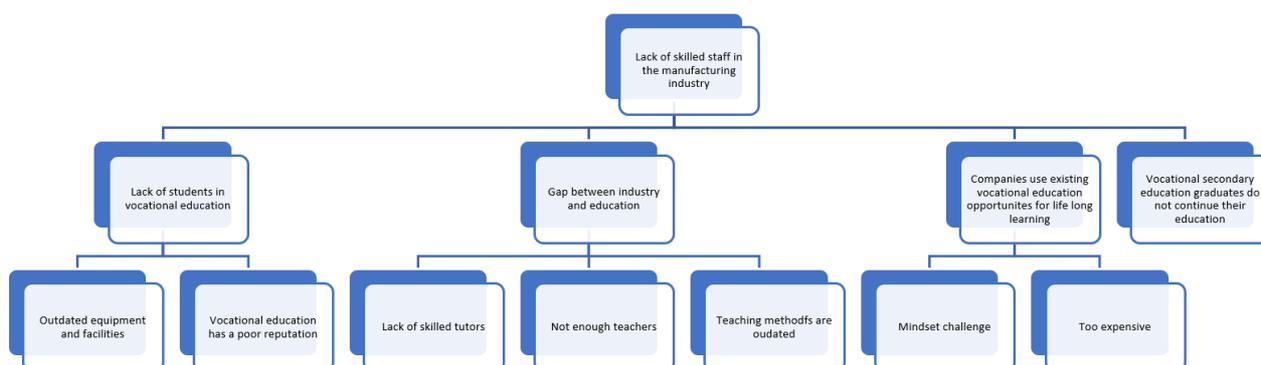
- **27% of the GDP of Bilbao is generated by Knowledge Intensive Business Services (KIBS)**
- **16,5% of local employment is ensured by KIBS**
- **40.000 students are enrolled in the three local universities (UPV, Deusto, Mondragon)**
- **EUR 4,646,114.12 Total ERDF budget was granted between 2017 and 2020**

2.2: Our starting point

2.1.3. FURTHER DETAILS OF THE POLICY CHALLENGE

The primary challenge in Tartu is the **lack of sufficient labour force, especially skilled workers, in the manufacturing industry**. Various challenges were mapped during the preparation of the Investment Plan and these were grouped and put into a hierarchy by using the problem tree methodology. Out of this exercise it became clear that the main challenges consist of various components. Figure 1 illustrates the hierarchy of problems.

Figure 1. Policy challenge in Tartu



1. Lack of students in vocational higher education, i.e., low enrolment numbers

The current graduates of vocational schools do not cover the shortage of skilled, qualified workers. There is a need to promote the manufacturing industry to young people. However, this also requires changes in the vocational education training in Tartu. The current system has various challenges.

Vocational education in Estonia has a **poor reputation** and is not attractive – students tend to prefer academic education in universities. On the policy side, while the importance of vocational education is increasingly recognised, it has not been reflected in funding as vocational education centres' budgets have remained stagnant for the past five years.

Tartu Vocational College (VOCO) is Estonia's largest vocational and further education centre. The municipality owns VOCO, while most other vocational schools in Estonia are state-owned. A unique challenge for VOCO is that its technical studies **equipment is severely outdated** (machinery from 1950-s and 60s), which does not make for an attractive learning environment and does not meet the industry needs. The school buildings also need renovation to provide a safe learning environment. Some vocational education institutions have received state support to update their machinery, but this is not the case in Tartu. On the positive side, in early 2022, VOCO has undergone a **visual renewal** - the result is a new brand that reflects modern values. This is expected to shift the mindset of people who were previously daunting the reputation of vocational education.

2. The current education does not meet the needs of companies. In other words, there is a gap between the industry and education.

There is a gap between education and industry. The level of students coming from vocational schools does not meet the expectations of companies due to the rapid development of technology. The summary of VOCO's alumni feedback of the last few years has indicated **a need to increase the share of practical teaching and to integrate theory and practice in the curriculum better**. Similar feedback has come from businesses.

Two reasons primarily cause this gap. First, some of the **teaching methods are outdated**. Industry develops and incorporates new technologies faster than teaching facilities can. A good connection between industry and education is essential to ensure that education is up-to-date and in line with the new and rapidly evolving demands of industry 4.0. The lack of teachers is also a challenge, as the salaries are not competitive. The average teacher's salary is much lower than the average salary of a qualified engineer. There are also formal requirements for qualified teachers, such as having a master's degree and for vocational education, they also need to have qualifications in their respective field.

Second, there are **not enough skilled tutors**. This problem also boils down to a lack of tutor training and sufficient compensation. The current financing model behind the work-based learning legislation is also not sufficient. The financing of the workplace-based form of study is carried out on the same basis as the financing of vocational education. The Ministry of Education gives vocational schools baseline funding. The directive allows vocational schools to cover tutoring fees but in a minimal amount. The school can transfer a maximum of 10% of the minimum teacher wage per month to the employer to cover the tutoring fee of the internship instructor. However, as this is calculated based on a teacher's minimum salary (1416 euros), then it only amounts to roughly 142 euros, which is not enough for companies to cover the costs of employing a tutor. In short, the current system has not enabled practical learning in a way that would meet the needs of society and industry.

3. Vocational secondary education graduates do not continue their education

While vocational secondary education has decent enrolment numbers, many of the graduates do not proceed to vocational higher education but rather decide to start working immediately. While it makes economic sense in the short term, it does not benefit the individuals in the long term as a formal certificate of vocational higher education opens more career pathways. For companies it means that they have a smaller pool of sufficiently skilled workers.

4. The currently existing vocational education programs have not been effective

There are also obstacles stemming from the legal framework. The current national regulation, the « Workplace-based learning implementation procedure » directive⁴, already allows for practical teaching in vocational education institutions. The directive allows to implement a workplace-based learning/apprenticeship model where 2/3 of the studies take place in businesses and 1/3 in the vocational school. In principle, it should enable learners to smoothly combine their studies and work and assist businesses in upskilling and recruiting. However, the system has been primarily used by companies to upskill their current workforce and to provide lifelong **learning opportunities** rather than train new workers. For this reason, the average age of vocational higher education students is 45. This can put companies at risk if they cannot hire and retain younger workers who can gain experience over a long period within the company.

⁴ Workplace-based learning implementation procedure, <https://www.riigiteataja.ee/akt/129122013002?leiaKehtiv>

While in other countries, such as Germany, apprenticeship is valued by businesses and is seen as an important recruitment tool and investment in the company's future, in Estonia, it has so far proven to be **too costly for Estonian enterprises** to do apprenticeship-based training. Furthermore, it is difficult for businesses to find qualified teaching staff or tutors. To some extent, it is also a mindset challenge; they do not see it as an investment in themselves.

2.1.4. PREVIOUS EXPERIMENTS AND EXISTING PRACTICES

VOCO's project to develop an internship system in the field of technology⁵

VOCO implemented a pilot project on the development of an internship system in the field of technology to deepen and diversify cooperation between existing partner companies and the school. The project consisted of trainings for school and company practice supervisors, teacher's internships in companies and involving practitioners in the teaching process. The aim was to develop new forms of internship and the overall internship system of VOCO. The scope of the project:

1. Training of school and company internship supervisors (5 training courses)
2. Development of the practice system of the educational institution
3. Development and piloting of new forms of internship (1 plan, 6 students)
4. Internship of lecturers and teachers with employers (3 teachers)
5. Involvement of practitioners in teaching (10 practitioners in the field of technology)

Most notably, the pilot included teaching at least 50% of the curriculum volume in the form of internships and practical work in the company. This was unique as students took classes directly within the company, making it very different from usual summer internships. The programme has received excellent feedback from the students; especially appreciated was the 1on1 tutoring. Each tutor worked with only 2-3 students making it a very personalised experience.

The project was piloted with metal and machinery manufacturing companies Hanza Mechanics Tartu AS and Tarmetec OÜ. The project ran between 01.02.2021-30.06.2022.

Entrepreneurial internship at VOCO⁶

From 01.02.2019-17.02.2021 ESF funds were used to pilot an entrepreneurial internship programme at VOCO. The project's goal was to enhance cooperation between companies and schools and to pilot a new form of internship that promotes entrepreneurship. The project consisted of 1) trainings for school and company internship supervisors 2) internships for VOCO teachers in companies to improve their professional skills and knowledge so that they would be updated on the practices and needs of the firms, 3) involving recognised practitioners in teaching to provide interesting and more practical lessons and 4) piloting a new form of internship in the ICT department.

⁵ VOCO homepage, <https://voco.ee/uldinfo/projektid/euroopa-sotsiaalfondi-esf-projektid/#tehnikaopraktika>

⁶ VOCO homepage, <https://voco.ee/uldinfo/projektid/euroopa-sotsiaalfondi-esf-projektid/#PraktikateemiarendamineTartuKHK-s>

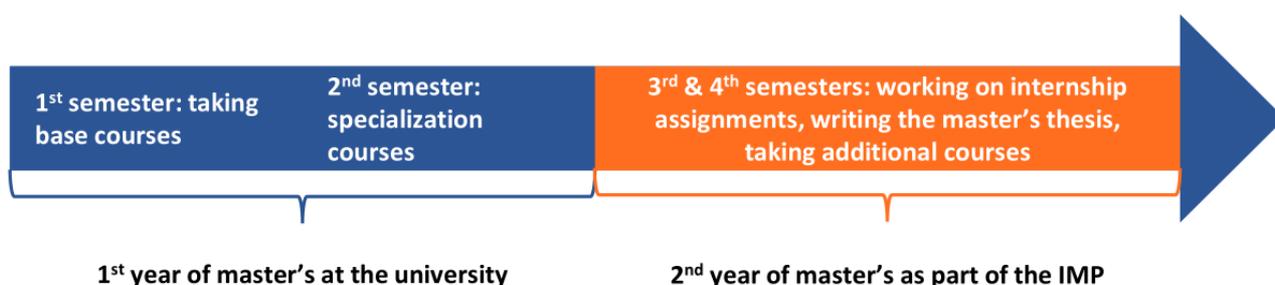
The project has given valuable experience in establishing collaboration between VOCO and enterprises regarding guiding interns. The project was a follow-up to an earlier project on developing the internship system.

Industrial Masters Programme at the University of Tartu⁷

The University of Tartu's Institute of Computer Science has piloted an Industrial Master's Program in IT into the manufacturing industry - a study format for the first-year master's students in Software Engineering, Computer Science and Data Science curricula, where 50% of the student's studies take place at a partner company.

The IMP is intended to make it easier for students to start their careers as they can immediately put their acquired knowledge and skills to practice. First-year students from Computer Science, Software Engineering, Data Science, and Conversion Master in IT curricula can apply for the programme given that they are on course to finish during the nominal two-year duration. If a student is elected to the programme, their second year of studies is spent at one of the university's partner companies or organisations as part of an internship. The partner organisations are SMEs, international corporations, manufacturing businesses, and government institutions. The partner companies use internal admission processes to select suitable students.

Figure 2. Structure of the Industrial Masters Programme



Source: <https://cs.ut.ee/en/content/industrial-masters-programme-it-0>

The programme offers many benefits to students. The student gets both a supervisor from the partner company and an academic supervisor. The partner company also assists the student in finding a topic for the master's thesis, making the output of the thesis more practical. As the internship is integrated into the programme's essence, students do not need to worry that getting practice gets in the way of their studies (as is often the case when students juggle studies and work/internships in parallel). Furthermore, the students are given a monthly scholarship.

"Profiõpe" pilot⁸

« Profiõpe » is a new pilot programme for dual education organised by the Education and Youth Board in cooperation with the Federation of Estonian Engineering Industry, the Ministry of Education and Research and vocational schools. The programme will start during the 2022/2023 academic year. The pilot is tested with three professions: CNC operator, assembly locksmith and welder.

The programme is intended for businesses seeking to find qualified personnel. The programme brings together a vocational school, a metal company and a young person looking for professional work which has

⁷ University of Tartu, Industrial Masters Programme, <https://cs.ut.ee/en/content/industrial-masters-programme-it-0>

⁸ Profiõpe website, <http://www.xn--profipe-50a.ee/>

already completed secondary education. Based on a tripartite agreement, vocational training occurs in parallel with starting an employment relationship in the company.

The programme tackles the challenges where students today often start working in parallel with their studies, but then the work takes prominence. The people end up in the labour market without a professional vocation. A third of skilled workers in the metal industry are without professional education. In contrast, a professional certificate would give them a better and longer career and create a lot more added value for their employer.

IT Academy's vocational education pilot programme⁹

The IT Academy program is a cooperation program between the Estonian state, universities and companies in the ICT sector. The goals are to ensure the labour resources necessary for the field and to create the prerequisites for achieving economic growth with the help of ICT through providing competitive ICT education to Estonian and international students.

The Ministry of Education and Research has launched a 4-year pilot project of the IT Academy to increase the transition from vocational secondary education to higher education. The programme aims to popularise ICT vocational education and raise its quality so that more graduates would enter applied higher education or bachelor's level studies.

The creation of the programme also meant the design of new curricula and a redesign of Software development and IT systems specialist study programmes. The scope of practical work was significantly redesigned, e.g., new practical tasks, simulation, study games etc have been developed. The programme is conducted in close cooperation with employers.

The programme lasts for 4 years. The last year of the study programme is largely practical. Graduates of the programme get a Level 4 professional certificate.

The ESF has partially funded this pilot. A similar pilot is currently negotiated concerning the launch of the Engineering Academy. One of the fields of the proposed academy could be the field of metal work.

City-wide elective course in technology

Tartu City in cooperation with VOCO and the city's general education schools, plans to open a city-wide elective course in technology, on the example of a pilot conducted in Peterson Gymnasium. Work with the city's education department and schools is already underway.

The University of Tartu Delta Centre¹⁰

Like Bilbao, Tartu has a physical hub where businesses and education unite. The University of Tartu Delta Centre, which opened in 2020, brings together a vibrant community of students, researchers, and innovators in computer science, robotics, technology, mathematics, statistics, economics, management and business. The complex was built to create a stronger collaboration of innovation among companies and the ICT and business faculties. The Delta Centre combines learning, excellence in research and the challenges of business and society, creating innovative solutions for economic and social progress.

⁹ Information Technology Foundation for Education, <https://www.hitsa.ee/ikt-haridus/ita/kutseharidus>

¹⁰ Delta Centre homepage, <https://delta.ut.ee/en/>

The entire complex is a 24,000 m² building in the city centre. The business section of the complex hosts banks (Swedbank, SEB), ICT companies (Cybernetica, STACC), accelerators (Tartu Science Park, ESA BIC Estonia) and the state institution Statistics Estonia.

The AI and Robotics Estonia (AIRE) Hub¹¹

The AI and Robotics Estonia (AIRE) Hub was set up in Autumn 2021. The hub has been created to make Estonian manufacturing more competitive by helping businesses to introduce artificial intelligence and robotics solutions. AIRE brings together manufacturing companies, solution providers, universities and science parks, with everyone striving for a single goal. AIRE helps drive innovation in the industry by bringing together the ideas of universities and the needs of businesses. AIRE works for industrial development and innovation in the whole of Estonia. Through AIRE, companies have the chance to use scientific and research laboratories and support big data management within High Performance Computing centres.

Tallinn University of Technology leads the hub. Its partners are the University of Tartu, the Estonian University of Life Sciences, Tehnopol Science and Business Park, Tartu Science Park, and IMECC OÜ. Professional associations, clusters, chambers of commerce, telecommunications companies, developers of robotics systems, banks, and importers of robotics are partners.

The Ministry of Economic Affairs and Communications has given support for the preparation phase – to design and test the services of AIRE. An important goal for the hub, alongside consultation is to attract more funding to support the innovative projects of businesses. The Ministry of Economic Affairs and Communications has supported the preparation of the AIRE centre from 1.06.2021 to 30.06.2022 with 821,338.42 million euros. As of June 2022, AIRE is a European Digital Innovation Hubs (EDIH) network member and has received a further 6 million euros from the European Commission.

2.1.5. ASSETS AND BARRIERS

The assets and barriers to achieve meaningful change in the current situation are listed below.

Table 2. Assets and barriers

ASSETS	BARRIERS
- Ecosystem players (city government, VOCCO, University of Tartu, manufacturing companies and general education schools)	- Legal obstacles to implementing the preferred model of dual education.
- VOCCO has undergone recent changes in branding and teaching-internship structures (through recent pilots). The interest in applying for technical studies at VOCCO is on the rise.	- Lack of funding to update study classes and machinery park at VOCCO and to give teachers/tutors a motivational salary.
- Rich experience on the national level through recent initiatives and programs such as the « Profiõpe » pilot, IT Academy's vocational education pilot programme, the	- While pilots have been conducted, there is still a mismatch between the needs of industry and what

¹¹ AI & Robotics Estonia homepage, <https://aire-edih.eu/>

AIRE hub, and opening of the UT Delta Centre. All have strengthened industry-education collaboration.	higher and vocational education institutions can teach.
- Strong cluster organisations, with the most outstanding being the Federation of Estonian Engineering Industry	- Still more clarity needed what the educational institutions can offer to manufacturing companies

2.3: The adapted version of the UIA project

In Tartu, the **main goal of this project is to transfer Bilbao's approach to developing an ecosystem which supports the manufacturing sector in Tartu by training students to use the tools, methodologies, and competencies necessary to thrive in industry 4.0.** Based on previous vocational programmes (German dual education format) and the experience from Bilbao, this project will focus on establishing a vocational education dual education training programme which will prepare students and industry professionals for a long career in the manufacturing sector.

Specifically, the city of Tartu identifies the following aspects of AS-Fabrik as particularly useful:

- **Co-creation and collaboration processes within AS-FABRIK:** AS-Fabrik utilised several methodologies to support co-creation and collaboration within the project: **triple helix collaboration** (dynamic network arrangements between overlapping institutional actors i.e., businesses, HEIs, students, local government, etc.) and **co-creation** (cooperation between two or more parties that creates added value for them and where the shared objectives are predetermined).
- **Education and training programmes:** Design and implement education and training programmes for a career in industry 4.0, specifically the manufacturing industry. The training programme, as carried out in AS Fabrik, includes training for professionals to develop technical skills to enter the industry 4.0 labour market, training for companies' personnel, and training for policy makers on topics such as embedded systems, data analysis, servitisation, innovation alliances, and industry 4.0.
- **Forging innovative alliances:** Bringing relevant and influential stakeholders and target groups together to enhance the effectiveness of the training programme.

In the scope of this Investment Plan, Tartu has decided to select one aspect to focus on:

- 1. Establish a dual education training programme to skill and reskill students/professionals for a career in the manufacturing sector.**

While AS-Fabrik focused on the entire industrial sector in Bilbao, with accompanying support mechanisms, the project in Tartu will be narrower in scope, focusing only on the **manufacturing** sector. This includes developing an education and training programme which connects students with relevant companies and forging strategic alliances within the city to: a) inform the design and implementation of the training programme; b) react to barriers and or challenges as they arise within the manufacturing sector so that the city of Tartu can adapt the programme to suit the local businesses, students, and HEI's needs.

The choice was made from a practical need to increase the supply of young workers who can be trained for a career in the manufacturing sector using the advanced digital tools and methodologies needed to thrive in industry 4.0. As mentioned previously, there is simply not enough skilled labour to ensure the continued growth and success of manufacturing companies in Tartu. Furthermore, VOCO's technical tools used in classrooms are severely outdated, with machinery being used from the 1950s-1960s. The investment will be used to introduce new equipment and tools so that students have the latest and most relevant machinery to use. Additionally, the funding will go to redesigning the vocational education programme that uses dual education model.

2.4: The integrated approach and the participative process

Conception of the idea - The manufacturing industry is experiencing a severe skills gap in the available workforce. The current widespread model of theoretical education in the school and basic skills training in school workshops with outdated equipment does not prepare the youth for modern Industry 4.0 workplaces. Neither does it help the image of manufacturing jobs among young people. A new program with closer ties to actual industry and workplaces was needed. VOCO started a **pilot** "development of the practice system in the field of technology" in February 2021. The students, partner companies and VOCO teachers received this pilot very well.

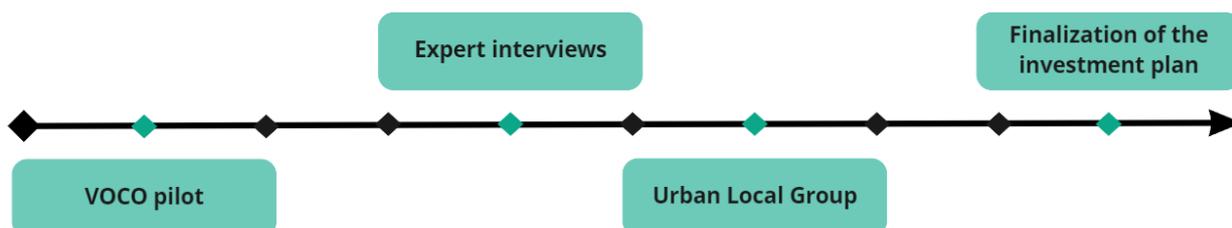
The process behind the idea - VOCO and partner enterprises' representatives have met for over two years, at least quarterly, to discuss the developments in the manufacturing industry and potential solutions that can be implemented in vocational education. According to needs, the meetings have also included one meeting with the Ministry of Education and Science representative and Tartu City Government representatives. The Investment Plan reflects those discussions and lessons from recent local and national pilots.

Participative process - Tartu City Government organised four **expert interviews** in June 2021 with the University of Tartu, Business Advisory Center, VOCO and former Head of Business Development department in Tartu City Government (Mr A. Lilles) to understand the local ecosystem and provide input for the Investment Plan.

In addition, Tartu City Government organised two **Urban Local Group (ULG)** meetings within the AS TRANSFER project (Oct and Dec 2021), validating the programme idea with them. ULG members included: AI & Robotics Estonia (i.e., digital innovation hub AIRE), University of Tartu, University of Life Sciences, VOCO, Business Advisory Center, Enterprise Estonia, Unemployment Insurance Fund, Estonian Chamber of Commerce and Industry, Tartu Science Park and enterprises (Kodumaja, Hanza, Foxway, Thermory, Metec, Fractory, Respo, Enics). Also, the stakeholders of the planned dual education training programme are represented in VOCO's governing board. The need for the developing of the training program was brought to the forefront by the enterprises.

Tartu City Government also organised the 1st transnational meeting (TNM) of the AS TRANSFER project in a hybrid format. The theme of the TNM was Talent Ecosystem. The meeting took place from 28th -29th October 2021.

After it had become clear that a new type of training programme would be the investment plan's focal point, a dedicated group of people set out to sketch down the idea in full. In June 2022, the City Government and VOCO partnered with the Baltic Innovation Agency, a Tartu-based consultancy firm experienced in supporting the local business ecosystem. Multiple discussions and brainstorming sessions were organised to **finalise the Investment Plan**. In parallel, the City Government and VOCO management discussed the funding needs and project budget.



SECTION 3: THE ADAPTED INNOVATION PROJECT

3.1: The Value Proposition

The **dual education training programme** will make more young people acknowledge the career possibilities in the manufacturing industry and bring motivated and skilled staff to the companies. The programme is attractive for students and practical for the industry. The resources and know-how of businesses and education are pooled in this model. As the programme enables students to spend part of their learning time at companies that use modern production lines, it oversteps the challenge of outdated teaching equipment. As the companies have a significant and direct role in providing education to the students, it enables them to influence what and how is being taught, thus closing the gap between education and industry needs.

The programme helps solve **the challenge of the manufacturing industry's lack of sufficient labour force**, especially skilled workers. All in all, this contributes to the strategic goals set in national and, more importantly, local development documents, which set the goal of Tartu being the home for viable and high-value-added companies. Indirectly, the project will contribute to further investments in the region and better life quality in general, attracting talent to stay or come to the city.

Table 3. The value created by the project for different target groups

Target group	Value created
Manufacturing companies	Companies get to shape the content of the education of their future workers. As there will be a better match between what is being taught and what is needed by the companies, there will be savings in the company's own resources. More accurately skilled labour force creates higher added value to businesses.
Vocational education institutions	The vocational education system becomes more modern and attractive. Higher enrolment increases the baseline funding from the state, which can improve the quality of education.
Students	The dual education model enables students to get practical experience through work without obstructing their studies (as it is an integral part of the process). Down the line, the acquired professional certificate will give them a better and longer career.
City	Better life quality attracts talent to stay or come to the region. A clear pipeline of young talent from VOCO can also attract new companies to set up their premises in Tartu.

3.2: The Workplan

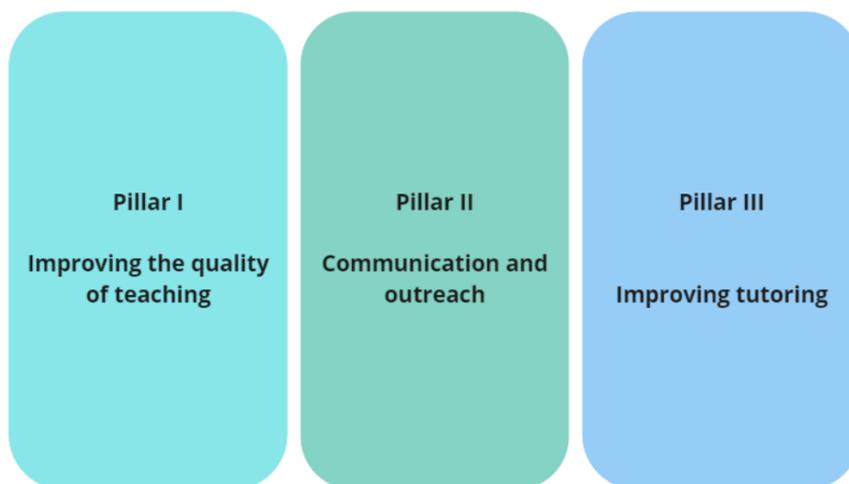
Based on the challenge mapping above it became clear that there is one solution that could tackle all these challenges, especially the first two. A completely new innovative form of education that brings together higher education and industry is needed. Therefore, the overarching Action of the Investment Plan is: **Implementing a dual education training programme**, a vocational education programme that is both **attractive for students** and **practical for industry**. It is the most feasible solution to solving the current challenge.



The project will implement a new vocational education training programme for the manufacturing industry in the city of Tartu that uses a dual education model. Dual implies that half of the training will take place within a company. This 50/50 split is preferred according to both businesses and vocational education providers. Within recent small-scale pilots, this model has proven to be the most beneficial and effective way to ensure students get a proper education.

The programme will have closer ties to actual industry and workplaces. The resources and know-how of businesses and education are pooled in this model. As the programme enables spending part of the learning time at companies that use modern production lines, it overcomes the challenge of outdated teaching equipment. Working and learning directly at a company makes the programme attractive for students. As the companies have a significant and direct role in providing education to the students, it enables them to influence what and how is being taught, thus closing the gap between education and industry needs. Companies can therefore be free of the retraining burden they currently face with recruits.

The project will be implemented for five years, from September 2022 to September 2027 (see more in section 3.4). This Action will be **implemented** through tasks that have been categorised under **three pillars**:



Pillar 1: Improving the quality of teaching

The quality of teaching needs to be improved to attract more students to vocational education and to ensure that teaching meet the needs of industry. This will be done through two sub-tasks: designing a new dual education training programme and renewing the teaching infrastructure.

Task 1.1: Designing a new dual education training programme

The project will implement a new vocational education training programme in Tartu that uses a dual education model. This approach can be the most beneficial and effective way to ensure students get a high-quality education. The programme will include advanced ICT/digital skills for industry 4.0. The ICT/digital skills necessary for the Industry 4.0 will be determined in the process of curricular creation, these could include cloud computing solutions for different industrial management processes (necessary for operating factories from a distance), AR and VR solutions for industry mechatronics, remote operations of industrial robotics. Within this innovative model the students will apply to the company and not the school. The concrete curricula for the programme will be developed at the beginning of the project with industry partners and will be adjusted throughout the years based on feedback from the students, teachers, tutors, and industry. Furthermore, any new manufacturing partner joining the programme will be able to express their needs and give their input to the programme design.

Task 1.2: Renewing teaching infrastructure

The VOCO management team has mapped the necessary investments needed to upgrade their teaching infrastructure. While a large part of the teaching will take place in the companies' modern facilities, it is still necessary for the VOCO classrooms and laboratories also to be modern so that basic training can be conducted in its facilities.

Pillar 2: Communication and outreach

Communication and outreach activities are needed to promote the programme and to attract applicants as vocational higher education suffers from a poor reputation and is not perceived to be attractive. Dual education in general is a relatively new concept in Estonia. Additional industry partners need to be recruited as the programme grows.

Task 2.1 Promoting the dual education training programme

A dedicated public (online) communication campaign will be launched to raise general awareness of VOCO's new dual education programme. This includes dedicated adverts, videos or radio messages and articles about the benefits of the new teaching model.

Task 2.2 Targeted communication to subgroups

Under this task, proper mapping of potential sub- and target groups will be conducted, and outreach strategies will be developed and implemented. Compared to Task 2.1 this communication is not limited to the dual education training programme, but rather the goal is to promote the manufacturing industry as such. Workshops and study visits will be organised to break false understandings of modern manufacturing jobs.

During Investment Plan preparatory meetings, it was understood that there are specific target groups that this programme should be communicated to:

- Primary school students – false perceptions of the modern manufacturing industry can be broken early on by organising study visits to companies and inviting company representatives to schools
- Graduates of secondary vocational education – many graduates do not proceed to vocational higher education but instead start working immediately.
- University dropouts are people for whom, for some reason, an academic education did not pan out, and they could be looking for other, more practical, education pathways.
- Youth not in employment, education or training (NEET) – unfortunately a growing target group today. A dual education model could be something that sparks their interest.
- Ukrainian migrants – Estonia is not a popular destination for migrants, but we have had close ties with people from Ukraine who come to work in Estonia. Now, with the war in Ukraine, the flood of migrants from there is growing and they should definitely be considered as one of the target groups within this program. The dual education is the easiest way for them to enter education or to continue an education that was interrupted due to the war. It enables support for language and culture learning because the emphasis is on practical learning, and therefore it is easier at the beginning when language skills are lower. The first young Ukrainians have already been accepted to the curriculum of CNC metal cutting machines at VOCO this fall.
- Teachers and parents – as both play an essential role in shaping the decisions of young people; it is also important that they have a proper understanding of modern vocational education, the manufacturing industry and career possibilities within.

Task 2.3 Recruiting additional companies

VOCO currently has a good working relationship with two manufacturing partners that can accommodate the number of students joining the program during the first year. In the long term, however, VOCO will need to engage with other manufacturing companies in Tartu to make the program more inclusive, diverse and attractive. An evaluation model needs to be set up to evaluate enterprises who wish to join the training program adequately. Specific criteria must be filled in to prove they can provide quality training. The details of the evaluation framework will be decided by the end of 2022. The plan is to include additional companies in 2023.

Pillar 3: Improving tutoring

As half of the learning within this new model takes place in companies, it is vital that tutors will have the relevant skills to be an instructor. Therefore, the Investment Plan also foresees training, compensation, and peer-learning activities focused on tutors.

Task 3.1 Short-term training for companies' personnel

In a work-based learning environment, the role of the tutor is significant. While in-house tutors will certainly know the ins and out of how to use modern equipment and technologies, they might be lacking in skills on how to pass this knowledge on to their younger colleagues. Therefore, a training program for the tutors is needed. Based on earlier feedback from industry, concise training is preferred. The planned short-term training lasts for two days or 16 hours. The program will run for the entire project life cycle and occur once every school year.

Within this 5-year period the training is targeted for larger manufacturing companies who have necessary (mainly human) resources for that. In Estonia, a large manufacturing company is considered with >250

employees. We do want to include SMEs as well in the following years, but we will have to see how this could be organized, e.g., via clusters. Of course, we can expect that some students who go through that learning model will also work for small or medium sized manufacturing companies in the future.

Task 3.2 Better compensation for tutors

In the new dual education training programme, the tutors will work for the company and not the school. Tartu City Government is committed to contributing financially to the tutoring support of VOCO students' practical studies in companies. Namely, 25 000 EUR has already been budgeted for 2022 with the city's additional budget. Furthermore, based on consultations with VOCO, a proposal will be made for the city's main budget for 2023. Moreover, VOCO and Tartu City are preparing to apply to the ministries for further state support for the dual study format.

Task 3.3 Peer-learning group

Peer learning has a proven track record of developing communication skills, teamwork, and even strengthening company culture. Peer learning has been used and promoted in teacher training to support teachers' self-development. The wood technology competence centre TSENER in Võru, Estonia, has run a pilot program for first-level managers in the wood industry that also involved elements of peer learning with excellent results. These peer-learning groups are a support activity in addition to the tutor training. Colleagues and people in similar capacities in other companies will come together to discuss their challenges and share their best practices. The meetings will be facilitated by VOCO and City experts. The peer learning group will meet once every 2-months during the school year. During the intermediate time, an online group (e.g., Facebook, Slack channel) or emailing list will be used to share questions and concerns.

Ambition

The project will run for 5 years. The ambition is that by 2027 the quality and reputation of vocational education in Tartu has increased, some of the policy challenges listed in Section 2.2 have been overcome, and the local manufacturing industry has become more competitive. The aim is to continuously improve the teaching methodologies through the years and incorporate more private partners, therefore establishing a model that could be replicated in other vocational education schools and regions. The work done within this project will not abruptly end in 2027, but rather it is one stage of the constant improvement of vocational education training in VOCO.

Out of the scope of this Investment Plan

Beyond this Investment Plan, other activities and processes need to take place to improve the manufacturing industry's situation in Tartu. Here is a list of activities that are relevant but fall out of the scope of the investment plan:

- Forging innovation alliances, i.e., bringing local stakeholders in the manufacturing sector together – This was an important element in the AS-Fabrik project. However, this is part of the daily work of the Business Development Department and is done through various meetings, initiatives and projects. This collaboration will benefit the dual education training programme, but it is too broad of an activity to tackle in the framework of the limited Investment Plan.
- Improving the quality of teachers - To attract good quality teachers, they also need modern infrastructure and adequate pay. While infrastructure is renewed within this project, the question of teachers' salaries is a more extensive policy challenge for the Estonian state. It cannot be solved by this pilot alone.

- Promoting vocational education as such – The challenges of the reputation and conditions of vocational (higher) education in Estonia are larger than what can be solved in Tartu alone. National effort is needed to increase the reputation and quality of vocational education. However, should such activities be implemented in the meantime, they will surely also improve the prospects of VOCO's dual education training programme. If the model implemented in Tartu is a success, it can also become an exemplary best practice for other vocational education schools to emulate.

3.3: Governance and delivery model

Partners involved in the project

The project partnership consists of the local government, the municipal level vocational education institution and manufacturing companies:

- **Tartu Vocational College (VOCO)** - the largest vocational and further education centre in Estonia.
- **City of Tartu** – the owner of VOCO and facilitator of the local innovation and business ecosystem. Two departments will be actively involved:
 - Business Development Department
 - Education Department
- **HANZA Mechanics Tartu** – manufacturing company offering complete metal manufacturing solutions for various sectors
- **Tarmetec** – manufacturing company specialised in steel products for the medical and food industry

The programme begins with two manufacturing partners that VOCO already has a good working relationship from earlier pilots. In the pilot the standards for enterprises to take part in the dual training will be developed in order to ensure the quality of the training. Then in the next phase further companies will be recruited using the positive examples of the companies from the first pilot. The concrete evaluation procedure for companies will take into account the EQUAVET quality criteria for vocational training and the national legislation governing the issuance of vocational training including the VET quality standard of Estonia.

The further recruitment of students can then be carried out with a larger range of companies where the companies pitch their offer to potential students and future employees.

Task 2.3 above describes the recruitment process.

Table 4. Project partners and their responsibilities

Name	Role	Responsibilities
	PP	Overseeing the project plan and activities, directing investment into regional education, monitoring project activities
	LP	Creating the training plan, negotiating with enterprises, making adjustments to curricula, organising trainings for tutors, creating suitable laboratories/workshops; Recruiting and evaluating enterprises who wish to join the training program (including setting up an evaluation model)

	PP	Taking part in the training program creation, allocating resources for carrying out practical training in the enterprise, recruiting students/participants to the training, sending enterprise employees to tutor training; promoting work-based learning.
	PP	Taking part in the training program creation, allocating resources for carrying out practical training in the enterprise, recruiting students/participants to the training, sending enterprise employees to tutor training; promoting work-based learning.
Enterprise 3 (to be recruited with an open call)	PP	Taking part in the training program creation, allocating resources for carrying out practical training in the enterprise, recruiting students/participants to the training, sending enterprise employees to tutor training; promoting work-based learning.

Governance model

Stakeholder collaboration and communication are crucial for the success of the vocational programme and the future development of the manufacturing industry in Tartu in general. In this project, the need for collaboration serves two practical needs: First, feedback from HEIs, students, and manufacturing companies will help enhance the quality of the programme by creating a feedback loop where the organisers of the programme can identify the needs of the target groups and co-create solutions to meet those needs. For example, if a company is looking for students with a certain educational background, then the HEI can help connect those students with the company. Second, innovation in the manufacturing industry is happening at break-neck speeds, with new tools, concepts, and methodologies changing the way companies operate. Effective communication channels between stakeholders will help all partners stay abreast of industry changes.

At the beginning of the project a **Steering Committee (SC)** will be established among the above-mentioned project partners. A representative of each partner will be appointed to the SC. Its role is to be an executive and operational body that oversees the implementation of the project. The body also provides support and recommendations for implementing and monitoring of the project.

3.4: Overall project schedule

The project will last from **September 2022 to September 2027**, with an active teaching period until June 2027. The total duration of the project is 60 months. The dual education training programme will be implemented for five years and each year a new cohort of students (approximately 15 per year) will join the programme. For a student, the study programme lasts for 2 years.

Most of the tasks will be ongoing through the project life cycle. The exception is the infrastructure renewal, which is expected to conclude by September 2025. While the training programme will be developed in the beginning of the project, it will be adjusted according to feedback and industry needs.

The following table shows the project schedule.

Table 5. Project schedule

Task	Timeline	Responsible partner
Task 1.1 Finalizing the design of the new dual education training programme	August 2022 – September 2022	VOCO
Task 1.2 Renewing the infrastructure	September 2022 – September 2025	City of Tartu
Task 2.1 Promoting the dual education training programme	September 2022 (repeats each summer)	VOCO
Task 2.2 Targeted communication to subgroups	March 2023 – September 2026	VOCO in close cooperation with the city and industry
Task 2.3 Recruiting additional companies	December 2022 – June 2023	VOCO
Task 3.1 Short term training for companies' personnel	October 2022 – December 2026	VOCO
Task 3.2 Better compensation for tutors	September 2022 – June 2027	City of Tartu
Task 3.3 Peer-learning group	October 2022 – June 2027	City of Tartu
Monitoring	<i>Throughout the project (see Ch. 5.1)</i>	City of Tartu
Evaluation	June 2027 – September 2027	City of Tartu

SECTION 4: BUDGET

4.1: Project costs

The following tables show the cost-structure of the planned project for implementing the dual education training programme in Tartu.

Table 6. General breakdown of project costs

Cost item	Cost
The total investment amount required to realise the project	7 500 000€
Equipment & infrastructure costs	7 200 000€
Teachers' salary cost	<i>Comes from school annual budget</i>
Tutors' salary/training cost	50 000€ /annually, 250 000€ for project life cycle
Planned communication cost (to promote the programme)	50 000€

4.2: Investment sources

The main funds for the proposed project will come from the city government, national funds and if possible, from EU funds. The Tartu City Government has committed to annually cover the enterprise tutor staff costs, roughly about 25 000€ per year.

The following table provides a comprehensive overview of identified funders and what they cover.

Table 9. Funding sources of the project

Funding source	Amount	Purpose i.e. to cover which cost items	Status
Tartu City Government main budget 2023	25 000€	enterprise tutor staff costs	in progress
Tartu City Government / Ministry of Education & Research /EU funds	7 200 000€	renovating the two technology buildings and their metalworking and welding workshops	plan
Tartu City Government additional budget 2022	25 000€	enterprise tutor staff costs	confirmed

Participating companies	25 000€	enterprise tutor staff cost; providing machinery and materials;	in progress
VOCO/EU funds	8000€	tutor training 160€ per person/ 50 tutors	Plan
VOCO/EU funds	500 000€	simulators: robot paws, production line etc	in progress
Enrolment fee or other revenue	Na	Na	not applicable

SECTION 5: MONITORING AND EVALUATION

5.1: The monitoring and evaluation approach

Monitoring supports the decision-making process of the project. Data will be **collected systematically** on the implementation of the Investment Plan. This will enable tracking the progress towards the output and result indicators – to see if actions are being implemented according to plan and to adjust implementation (improve progress and quality) if needed. The monitoring approach enables the identification of deviations at an early stage, so provides the ability to mitigate them.

The monitoring activities will be carried out by the lead partner VOCO and the City Government. If needed, external evaluators will be recruited. Many monitoring activities require the participation of various stakeholders and target groups, e.g., students, graduates, teachers, tutors and businesses.

The project Steering Committee requires three types of information to monitor the project progress. First, it needs regular qualitative feedback (e.g., surveys, seminars) to adjust the details of the dual education training programme. Second, the project needs to monitor its output and result indicators to see if everything is on track to bring about the expected change. Third, the project needs to monitor its resource consumption. The following table includes planned monitoring activities.

Table 10. Monitoring activities

Monitoring activity	Purpose	Timeframe	Actor responsible
Programme participant survey	To assess the satisfaction of the dual education programme	Once a year	VOCO
Graduate survey	To measure the impact of the programme. <i>Is the graduate working in a high-skilled manufacturing job? Are they working in the same firm that they did their programme in?</i>	Six months after graduation	VOCO
Feedback seminar with school and enterprise representatives and students	To collect feedback on the programme from the parties involved	At the end of the semester	VOCO
Interviews with enterprises participating in the dual education programme	To collect the businesses' insights whether the programme has been able to prepare students for their working life. <i>Has the gap between education and industry been closed?</i>	Once a year	City Government
Reviewing output indicators	Taking stock of output indicators	Once a year	VOCO
Reviewing result indicators	Taking stock of result indicators	Once a year	VOCO

Resource consumption	Tracking expenditure to remain in the limits of the budget	Once a year	VOCO
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Potential obstacles to the monitoring approach

- The sample is too small to make significant conclusions – depending on how many students enrol in the first years of the programme, it might be complicated to make conclusions based on the survey and statistics.
- Limited response rate to the survey – as with any survey, it is hard to guarantee that the target group will take the time to respond. This can especially be an obstacle in the case of graduates who have moved on with their lives and might have limited motivation and time to fill in VOCO's surveys.
- The reluctance of tutors or businesses to participate in the seminar/focus group – Business people are busy with their day-to-day activities and might not have the time or see the added value in attending such discussions.

Evaluation

The evaluation will be done at the end of the project, between June-September 2027. The evaluation will analyse the performance and achievements of the project across the five years of implementation. The evaluation will investigate the programme's impact on the socio-economic challenge addressed with this. Action: **the lack of skilled staff in the manufacturing industry**. Namely, the number of new jobs created, value per employee, revenue, and profit in the manufacturing sector, will be analysed using statistical data (and compared to baseline data). The evaluation will also have a qualitative component that condenses the feedback received throughout the implementation of the dual education training programme. The evaluation will be done "in-house" by the City of Tartu.

5.2: The monitoring and evaluation framework

The main challenge tackled with the Investment Plan is the **lack of a sufficient labour force, especially skilled workers, in the manufacturing industry**. The project has **one Action**: Implementing a dual education training programme, a vocational education programme that is both attractive for students and practical for the industry. The project has **one Specific Objective**: Increase the number of skilled workers in the manufacturing industry in Tartu.

Table 11. The Output and Result indicators of the Action (Target 2027)

Tasks that contribute	Output indicator	Result indicator	Source of info for result indicator
T1.1, T1.2	No. of students in the programme Target: 75	Dropout rate Baseline: 20% Target: 10%	VOCO's internal statistics
T2.1	No. of promotional campaigns Target: 5	Increase in the no. of graduates continuing to work in the field	Graduate survey
T2.2	No. of targeted communications (study visits, workshops, etc) Target: 10	Baseline (2020): 53% Target (2027): 70%	
T1.2	No. of equipment updated, changed, renewed	No. of teaching buildings renovated Baseline: 0 Target: 2	City statistics
T2.3	No. companies involved in the dual education programme Target: 3	No. of companies in Tartu that are involved in dual education programmes	City statistics
	No. of enterprises evaluated by the school Target: 5	Baseline: 0 Target: 3	
T3.1	No. tutors trained Target: 15	Increase in active personnel who have tutoring experience Baseline: 0 Target: 20	City statistics
	No. of training sessions organised Target: 5		
T1.1, T2.3, T3.2	No. tutors involved in the programme teaching Target: 20		
T3.3	No. tutors attending peer learning Target: 12		