



Applied Innovation and Research in  
Vocational Education and Training

## **D2.2 Publication on AR actors, business models and case studies**

Issue date: 03/11/2023

Version: Final

## D2.2 Publication on AR actors, business models and case studies

Lead partner Tknika  
Issue Date October 2023  
Authors Jone Etxebeste, Iñigo Araiztegui, Unai Ziarsolo, Pili Alonso, Iñigo Mujika, Eneko Aizpuru, Beñat Konde, John Edwards, Marta Rodrigues, Jakub Grodecki, Dirk de Wit, Melanie Henke, Anna Maria Czarny, Henning Klaffke, Ixaka Egurbide, Oier Uriarte, Barbara van Ginneken, Boudewijn Grievink, Josu Riezu,  
Version Final  
Reviewed by Project Management Team  
Approved by Project Management Team  
Dissemination level Public

## Revision and history chart

Version	Date	Editors	Comment Description
1	01/10/2023	EURASHE and Tknika	-
2	15/10/2023	EURASHE and Tknika	-
3	19/10/2023	All partners	-
Final	03/11/2023	All partners	-

## Publishable executive summary

This is deliverable D2.2 of the Applied Research and Innovation in Vocational Education and Training, AIRinVET, project. The aim of the document is to gather findings about: activities, collaborations, fields of study, case studies, knowledge transfer, methodologies, outcomes, resources, student learning, technology adoption, financial models and policy context of the applied research activities carried out by vocational education providers.

This report provides an inventory of existing practices and practical examples in Applied Research and Innovation carried out by vocational education and training centres.

The mapping exercise covers a wide range of organisations pertaining to provide vocational education with a view to enhancing peer-learning amongst practitioners. It will allow practitioners and policy makers to benchmark their initiatives and help them to better grasp the similarities and differences across organisations and countries.

The report has been prepared in consultation with VET education providers and other organisations related to VET education and Research and Innovation. The consultation is based on the AIRIN VET Business Model Canvas, which is a contextualization of Research and Innovation activities in VET, and it is carried out through a combination of desk and field research.

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## 1. Introduction

Applied Research in Vocational Education and Training (VET) is a contested topic: some people say there is applied research in VET, others deny it; some say there could be, others say it is impossible. A clumsy way to proceed for any serious analysis of the issue would be to take for granted that there is applied research in VET and then try to find matching examples. It would be a biased way of proceeding with the study because rather than apprehending reality, we would aim at confirming our beliefs. Even clumsier than that would be to invent a definition of “applied research in VET” and then make it fit with whatever a handful of VET organisations do. Expressions such as “this is applied research for us” are not acceptable because a) they make any international comparison with whoever is not part of “us” impossible; and b) it creates a mismatch with already established definitions, like the ones of the OECD. The clumsiest of all would be to exaggerate the previous to the point of saying “this is applied research in VET for me”. This level of subjectivity would lead us to a situation in which we will be referring to virtually anything as an “applied research” activity as long as it fits with whatever “for me” means. In a previous deliverable of the project<sup>1</sup>, we decided to adopt OECD’s definition of applied research: “an original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective” (OECD 2015). Our work will be then to map such activities in VET.

## 2. Vocational Education and Training

Before starting to map activities, it is important to define what it is meant by “VET” and what types of institutions (and groups of institutions) can be described as VET centres. This is because contrary to popular belief, VET is not a level, but a mode or form of education and training. The two most accepted definitions of VET are given by UNESCO and CEDEFOP.

- All forms and levels of the education process involving, in addition to general knowledge, the study of technologies and related sciences, the acquisition of practical skills, knowhow, attitudes and understanding relating to occupations in the various sectors of economic and social life. (UNESCO-UNEVOC. TVETipedia Glossary)
- Education and training which aims to equip people with knowledge, know-how, skills and/or competences required in specific occupations or more broadly in the labour market. (Cedefop. Terminology of European Education and Training Policy. Glossary.)

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<sup>1</sup> D2.1 Applied Research in VET Glossary [D2-1 Applied Research in VET Glossary final \(1\).pdf \(airinvet.eu\)](#)

This broad definition of VET creates a diverse landscape on which to base our analysis of Research and Innovation (R&I) activities. Some of the factors to affect the analysis include:

- Different names for VET, within Europe and internationally.
- Different duration of the study paths. There is no such thing as a definite duration of a VET qualification.
- Different training modalities. VET could be studied in a variety of ways: different models of apprenticeships including dual education, blended learning, online, part-time, night offer, etc.
- VET systems are differently managed: public systems nationally or regionally private management, and public-private partnerships.
- Different functions of VET providers, ranging from countries where their only mission is to provide initial training, to countries where VET centres provide a wide array of services apart from initial training, including lifelong learning.
- Within Europe VET is provided at many different levels of the European Qualifications Framework (EQF), and there is no homogeneity across Member States.

As pointed out by CEDEFOP (2017), one particular trend is the expansion of VET into higher education areas. On the one hand, we may define Professional Higher Education (PHE) as higher VET, in which a degree is awarded at EQF levels 5 and 6, or even 7 and 8. In this case students are trained for a particular occupation in the labour market (e.g. engineer or nurse). On the other hand, there is a growing popularity in dual education at higher levels, where students study and work at the same time, leading, in some cases, to a dual degree. Finally, students may study for a VET qualification and a higher education degree simultaneously, which is the case at one of the partners of the AIRinVET project, the Berufliche Hochschule Hamburg.

When it comes to a VET centre, we adopt the following similarly broad definition: *A VET centre is to be understood as any education and training provider which aims to equip young people and adults with knowledge, skills and competences required in particular occupations or more broadly on the labour market. It may be provided in formal and in non-formal settings, at all levels of the European Qualifications Framework (EQF), including tertiary level, if applicable on the national, regional, or local level, we can classify VET providers as having only one function or more than one function.*

This definition implies that VET:

- Involves young students and adults. In other words, all age groups and all European citizens are potential VET students.
- Aims to equip any person with knowledge, skills and competences related to the labour market.
- VET can have other functions, such as entrepreneurship or research.



- Studies do not need to be connected to a particular occupation; they can have a broader focus, although always in connection to the world of work.

These are the type of institutions we will consult in the mapping. However, this broad definition of VET also creates difficulties when comparing levels and countries. For example, it allows many programmes at Universities of Applied Sciences (UAS) to be defined as VET but at the country level it is unlikely that a University of Applied Sciences would consider itself as a VET centre.

The primary function of all VET providers in Europe is to train students, giving them the knowledge, competences, and skills required for a specific job or occupation. This training is usually extended to reskilling and upskilling functions as part of continuing VET. We will refer to VET centres which have as their sole function to provide initial and continuing VET, or only initial, or only continuing, as “unifunctional”. But many VET providers extend the scope of their activities further: technical services for companies, working as incubators for entrepreneurs, providing services for the community, etc. We will refer to these as “multifunctional VET centres”. Multifunctional VET centres are centres that perform the activities of an “unifunctional VET centre” (training) and complement them with other activities that differ from training (Retegi and Navarro 2018).

The European initiative on Centres of Vocational Excellence is advocating for multifunctional VET centres (Erasmus+ Programme Guide): “VET is an integral part of skills ecosystems, contributing to regional development, innovation, smart specialisation and clusters strategies, as well as to specific value chains and industrial ecosystems; it is part of knowledge triangles, working closely with other education and training sectors, the scientific community, and business; it enables learners to acquire both vocational (job specific) as well as key competences through high-quality provision that is underpinned by quality assurance; it builds innovative forms of partnerships with the world of work, and is supported by the continuous professional development of teaching and training staff, innovative pedagogies, learner and staff mobility and VET internationalisation strategies”.

The mapping will include both unifunctional and multifunctional VET centres but the latter are clearly more relevant when it comes to the potential for R&I: Apart from training people, VET centres can help companies (especially SMEs working in more traditional technologies and sectors) to be more competitive, help regional ecosystems to exploit innovation and benefit from new technologies, promote entrepreneurship, and even work as a “boundary spanner” making agents with varying goals and interests meet and work together. This transformative role that VET Centres can and are playing in their regions has often been highlighted in studies of higher education institutions (Edwards et al 2017). It is therefore useful to include UAS and other institutions offering PHE in our analysis, because all types of VET centres may learn lessons for the development of their own R&I activities. Consequently, many UAS and similar institutions have been interviewed as part of the mapping.

Our initial impression is that we will find applied research activities in VET centres related to higher EQF levels, even though EQF and research are independent, and in VET centres that are multifunctional.

## 2.1 Applied research.

Applied research seems to be one of these things that although not difficult to distinguish theoretically, in the laboratory of our mind, it is tricky to disentangle in practice, in the world. Since the late nineteenth, and mostly since the early twentieth century, several authors established a direct relationship between research and technological innovation which was very influential in conceptualising innovation, conceptualising research and related activities, designing funding programmes, and science, technology and innovation policies. In the two big conflicts of the 20th century, particularly in the Second World War, countries like the United States learned that by investing in research and making researchers and industrialists work together they were able to create incredible innovations, such as the atomic bomb. When the war finished, the Government wanted to exploit the system for peacetime. According to the popular story, on November 17, 1944, President Franklin Delano Roosevelt addressed a letter to Dr. Vannevar Bush asking for advice to apply the lessons learned during the wartime to continue supporting fast technological progress during the peacetime “New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we waged this war we can create a fuller and more fruitful employment and fuller and more fruitful life”. (Bush 1945) and Dr. Bush answered with the world-famous report *Science, the endless frontier*. Economists were also important making innovation a key growth factor for the economy.

Several taxonomies of research, or knowledge activities that allegedly led to technological innovation emerged in the early twentieth century. These taxonomies classified terms such as “basic research”, “pure research”, “uncommitted research”, “applied research”, “development”, etc. These types of distinctions are still common, especially since the OECD standardised them in the 1963 edition of the Frascati manual as “basic research”, “applied research” and “experimental development” (OECD 2015). However, it can be rather vague to understand if we are referring to differences in terms of epistemology, intention, the distance between the research and its practical applications, the institution producing the research, disclosure norms or the scientific field (Calvert 2006). In any case, industries started lobbying and arguing in favour of industrial research, or applied research and development, and this had an economic and political influence. In the first half of the twentieth century a model was put together according to which basic research is followed by applied research, then development, production, and commercialisation. The invention of the model, also known as the “science push” model, is usually attributed to Vannevar Bush or to Joseph Schumpeter, but Benoît Godin (2017) argues that the Science Push model is the construction of several agents, industrialists, consultants, business schools, and economists. It was probably the interest of those actors to defend the model. For scientists, they were

giving social importance to their work and justifying public funding. For industrialists, it was a way of attracting scientists to work in their R&D labs. For engineers, it was a way of improving the status of their discipline. For some governments, it was a way of defending democratic values by protecting uncommitted research, especially in comparison with Nazi Germany. (Godin 2017)

The main idea of the science push model is that researchers at some organisations, normally universities, discover new knowledge, without any practical application in mind, it is just pure knowledge. There are then other organisations, normally applied R&D divisions in the industry, which work on researching to find potential applications. The potential applications of applied research are still far from being used but the research is carried out with practical applications in mind. The results of applied research are transferred into production by means of development. Development is an activity, normally carried out by engineers in industrial development labs, that consists of finding productive applications for applied research results. Then these developments, if successful, are implemented in production and then new products are commercially available. This theory is related to the idea that technology (applied science) comes from basic science by finding applications of science. The implications for policymakers who want to design innovation support policies are clear: they should support basic research and scientists as knowledge and truth seekers with the hope that then industries and public organisations, through their applied research laboratories will be able to find some promising applications, that could then be put into development and, if they are successful, moved to production and then to the market. The implications for companies are similar: invest in laboratories where scientists are allowed to research things. Most of their findings will be useless but the company will be able to put some of their findings into production (and then into the market) through the development unit.

Few will accept such a model of innovation today, but why did it then become so prevailing? According to Godin (2017), this form of understanding innovation became an accepted fact when the OECD crystallised it in the first edition of the OECD Frascati Manual in 1963 (OECD 1963). In fact, statistics contributed considerably to the construction of the official definition of research. It took decades before research came to be defined for statistical purposes. Yet this did not prevent measurement. In the early 1960s, the OECD took the task of concentrating on different practices (mainly from the US, Canada, and Britain) for measuring research. OECD member countries adopted the Frascati Manual, a methodological manual concerned with conventions to follow in conducting surveys of R&D. The manual, still in use, proposes concrete definitions of concepts to be measured, it suggested the classification of the activities measured, and it made recommendations on numbers and indicators to be produced. However, the differences between the main terms of the taxonomy, “basic research”, “applied research”, and “development”, continue to be vague.

The conception of innovation as a series of steps from scientific discovery to the market has been opposed by demand pull, coupling and systemic views of innovation (Godin 2017). According to the

demand-pull model, innovation starts with a market need and then applied research and development are carried out to create a new product that meets the need. This second “model” of innovation downplays the importance of scientific research and makes market needs the key driver of innovation. Good arguments can be found in favour of both the science push and the demand-pull model of innovation, which led some authors to talk about the “coupling” of market needs and research.

There is still a third group of theories that understand innovation as a systemic endeavour. Since the 1980s, it has been influential in policymaking through the national and regional innovation system concept. The concept appeared in an unpublished paper by Christopher Freeman in 1982, Bengt-Ake Lundvall used it in a booklet in 1985, Freeman used it again in 1987 and, in 1988, Freeman, Lundvall and Nelson used it again. Since the 1990s, the OECD adopted the concept and, through the OECD, it was very influential for policymakers. The main messages of the new approach were (Chaminade, Lundvall and Haneef 2018):

- Move from a science push view of innovation to a paradigm of interaction and networking.
- Move from a linear view (whether it is science push or demand-pull) of innovation to a systemic view.
- Include new sources of innovation apart from research. For example, experience-based learning taking place within firms or the learning interactions between research and industries are important sources of innovation.
- The importance of the context, there is no one size fits all policy.

Systemic theories were, and are, influential in policymaking. In the 1990s and the two first decades of the 2000s, many governments adopted the national /regional system approach for innovation policy. OECD’s work was very relevant to it. In Europe, they have been further strengthened through Smart Specialisation Strategies (S3). The idea of Smart Specialisation emerged in the Knowledge for Growth expert group created by the European Commission to assess DG Research by analysing the causes of the lag of the European economy if compared to the United States. The concept was developed around 2008 (Hall 2011) and was very influential in European policymaking. S3 became part of the 2020 innovation plan of Europe, the Europe Flagship Initiative on Innovation Union: Transforming Europe for a -post-crisis world. (European Commission 2010). S3 became an ex-ante conditionality, and every Member State must have a S3 to receive European Structural Fund support (European Commission 2012).

We believe that the more important element when discussing about R&I in VET is to identify if VET plays a role in S3 and, consequently, has a positive influence on innovation systems. This is way more relevant than knowing if VET does or not applied research. What we would like the project to evidence is that VET is, or can become, a relevant actor of an innovation system in activities that go further from skilling, upskilling, and reskilling. Literature on the topic is still scarce but we hope it will grow. Mikel Navarro

(Navarro and Retegi, 2018) pointed out that VET shows its full potential just in the parts ignored by the literature about innovation systems. This is probably the reason why universities have been included as important agents of regional innovation and not VET:

<b>Focuses on regional innovation literature (strengths of the university)</b>	<b>Omissions of regional innovation literature (strengths of VET)</b>
Knowledge generation It has focused on universities, financial markets, and capital, and ignored the labour force and labour market	Knowledge diffusion and exploitation.
Science push model of innovation	Innovation based on interaction, experience, and collaboration (Lundvall's DUI model for example)
High technology sectors and big companies	Traditional, low-technology, sectors and SMEs
Minority of people with very high qualification levels (PhDs., engineers, scientists, etc.)	Intermediate technical levels
The region	Varying local contexts within a region

## 2.2 What we will map (and what not)

We are drawing a clear distinction between **“research about VET”** and **“VET carrying out research”**. Only the second one is of our interest. We will map non-teaching and learning activities of VET centres, understanding in the broad sense VET commented above, that might have an impact in S3. This does not mean that we consider these activities applied research.

Moreover, we can identify two main discourses about innovation and VET. On the one hand, there is a conception of innovation as an internal element, in terms of implementing new curricula, new teaching and learning methodologies, new activities, new technologies, new management systems, and so on. On the other hand, there is a conception of innovation as an external element, one that understands that VET plays a role in a concrete innovation ecosystem. We will refer to the first as “VET innovation A” and the second as “VET innovation B”. The last edition of the Oslo Manual defines innovation as (OECD 2018):

Introducing improved products or processes (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the VET centre (process).

Following this definition, VET innovation A refers to:

Introducing improved products or processes (or combination thereof) that differs significantly from the VET centre's previous products or processes and that has been made available to potential users (product) or brought into use by the VET centre (process).

VET Innovation B refers to:

The contribution of a VET centre to the local, regional or national innovation system, especially when it goes further than skilling and when it has an impact in the introduction of improved products or processes (or combination thereof).

We are interested in the second type of innovation.

The guiding questions for our mapping are, then, “Can we identify non-teaching and learning activities carried out by VET centres, which can be understood as R&I and have an impact in S3? And, if so, can we spot applied research activities among the non-teaching and learning activities with a potential impact in S3?” We can anticipate to our readers that we will get a nuanced answer.

### 3. Analysis of applied research activities in VET providers

#### 3.1 Research Approach for mapping

In our study, we have adopted a qualitative research design to elucidate the involvement and actions of vocational education provider organizations in applied research endeavours, particularly in collaboration with companies.

Our approach can be summarised as “LOOK – IDENTIFY – COMPARE,” outlining the progression from observing to identifying and ultimately comparing various aspects.



To undertake this qualitative research, we opted for a case study qualitative design to provide a comprehensive description of these organizations.

In conducting the case study, we gathered data through desk research and interviews. The interview structure was based on the AIRINVET business model template, focusing on common and notable themes (dimensions). This research method delved into the specifics of individual users or groups, aiming to discern prevalent patterns within these dimensions across organizations and countries within the European context.

In the LOOK phase, the first step of the mapping process was to set basis for a common understanding of the applied research in VET concept. A landscape analysis of how VET institutions approach applied research in terms of activities, collaborations, fields of study, knowledge transfer, methodologies, nomenclature, outcomes, resources, student learning, and technology adoption.

Thus, we dig deeper in the concept explained in the glossary and broke down the term into the dimensions we wanted to explore and the categories among which we broke down the activities carried out by VET providers.

## CATEGORIES

- CATEGORY 1: Main Function of the institution (1) Initial training (All VET centres would cover this activity).
- CATEGORY 2: Other functions besides the main function, e.g., Continuous training (workers and or unemployed), Entrepreneurship, Career guidance, Dual system/apprenticeship systems, Train the trainers, Guidance on disabilities or drop out.
- CATEGORY 3: Functions related to Skills development and pedagogy, e.g., Curriculum updates, program updates, implementation of technologies in curricula (pedagogic aspects). These are usually in collaboration with an accreditation body. Research on learning methods and pedagogics, Activities towards inclusivity, Consultancy services for firms: Skills gaps analysis, training needs analysis, design of training programs for upskilling. Research on job transitions in companies/industry sectors/markets and its implication in skills and training systems.
- **CATEGORY 4\*\***: Implementation/testing of Technologies in the institution (internal), e.g., Implementation of technologies in curriculum (didactic KETs), Test new technologies/machines, Integrate KETs, Activities towards sustainability/greening. We have referred to it as “VET Innovation A”.
- **CATEGORY 5\*\***: Services for companies, e.g., technical services for companies; Activities to solve real life/production problems (Test beds, Sharing equipment / machines with companies, Proofs of concepts, testing, simulations). We have referred to it as “VET Innovation B”.
- CATEGORY 6: Forecasting; Trends in skills developments, Skills analysis, Trends in pedagogies, Trends in technologies, social trends, Sustainability trends.

The categories on which we are focusing mostly is **category 5**.



## DIMENSIONS.

- DIMENSION 1: This dimension lists (and briefly describes) the different type of activities that the organization carries out.
- DIMENSION 2: Type of organization and Academic profile
- DIMENSION 3: Research Methods
- DIMENSION 4: Research outputs
- DIMENSION 5: Agents involved (only in category 4 and category 5)
- DIMENSION 6: Targets, impact, assessment methods
- DIMENSION 7: Motivation, mind-sets, incentives
- DIMENSION 8: Strategies
- DIMENSION 9: Barriers, enablers

This activity helped us develop the final AIRINVET business canvas model that was the basis to develop the interviews and report them.

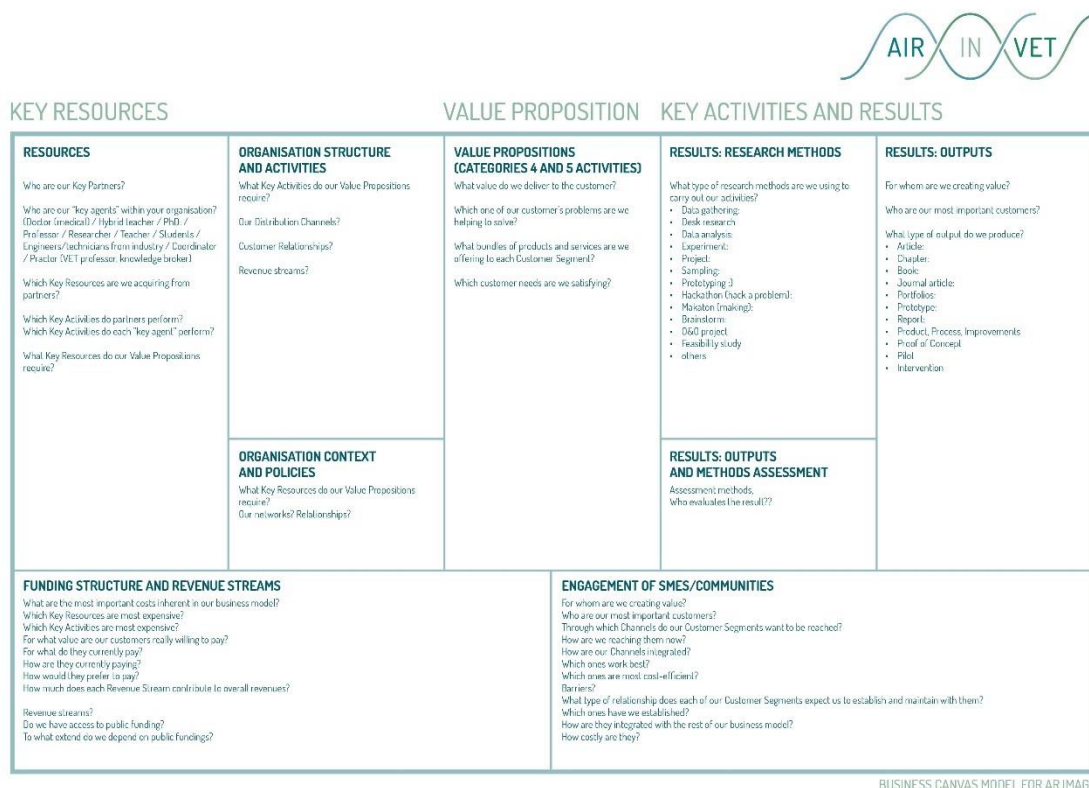


Figure 1 AIRINVET Business Canvas Model

This is a Business Model Canvas to document the existing activities in applied research in VET education providers organisations. We have redefined the building blocks of the applied research activities to above



structure. It defines the structure for conducting an organisation context analysis, presents a refined indicator system for assessing the quality and performance of the system in terms of outcomes and results, and describes the key elements of the assessment process.

The IDENTIFICATION phase was the interviews process.

The interview process commenced with specific criteria, guiding the interviewer in engaging with the participant, asking pertinent questions, and delving into the motivations and decision-making processes. A generic script provided the structure for these interviews.

Furthermore, we conducted a territorial analysis to gain deeper insights into the diverse challenges associated with applied research, directly engaging with the target audience to inform this mapping initiative.

And finally, for the COMPARISON we record the interviews information in common templates.

### **3.2 Target Audience**

Initially, our focus for this mapping research was VET providers. However, during the interviews, we discovered that in some cases, these providers collaborate with affiliated organizations, engage in public-private partnerships, or work with newly established entities to conduct applied research activities. Consequently, we broadened the scope of our interviews to encompass various types of organizations beyond traditional VET providers.

We took the target audience for sampling and data collection, focusing on networks already working in applied research, such as the WFCP affinity group participants as well as partners network and derived organisations suggested by interviewees.

The criteria for choosing our interviews were:

- a mix of providers and countries
- a mix of providers with a focus on research activity and others with no research activity

To have a clear procedure for data collection we designed a guide for interviewers, and an information and consent sheet for interviewees.

## INTERVIEW PARTICIPANT INFORMATION SHEET

Project name: Applied and Innovative Research in Vocational Education and Training (AIRinVET)  
 Start and end date: 01/01/2023 – 31/12/2024  
 Co-financed by: Erasmus+ (Partnerships for Innovation - Forward Looking Projects)  
 Project website: [www.airinvet.eu](http://www.airinvet.eu) Contact: [info@airinvet.eu](mailto:info@airinvet.eu)

### Introduction

Dear participant,  
 We invite you to participate in the AIRinVET project with an interview by our regional researchers. This sheet provides an overview of the project and aims to inform your decision on whether to participate in the interview. Please read this sheet carefully and ask all the questions you might have. Your consent to be interviewed is completely voluntary. By participating in the interview, you are indicating that you have read the description of the study, are over the age of 18, and that you agree to the terms as described.

### Organisers of the project

The AIRinVET project has received funding from the Erasmus+ program "Partnerships for Innovation - Forward Looking Projects". It is coordinated by **IKNKA** - Departamento de educación del Gobierno Vasco (Spain). The consortium consists of eight project partners: **EURASHE** (Belgium), **Berufliche Hochschule Hamburg** (Germany), **Hanse-Parlament** (Germany), **KATA PULT** (Netherlands), **ISSO** - TECHNIEK NEDERLAND (Netherlands), **AFM** - Cluster for Advanced & Digital Manufacturing (Spain) and **BHM** - Advanced and Digital Manufacturing Campus (Spain). The project is supported by 33 associated partners from the strategic triangle of applied research and VET/HVET.

### Purpose of the project

The objective of AIRinVET is to define the role of VET in R&D by proposing a European reference framework for AR in VET. In order to do this, we want to understand and learn from already existing experiences and activities. This framework will help European countries and regions to build more competitive innovation systems.

### Concrete results will be:

1. Mapping of VET centres involved in AR in Europe and abroad.
2. Collection of case studies to explain, describe, evaluate, and understand different approaches to do AR in VET.
3. Analysis of AR activities in different policy contexts in Europe.
4. Identification of financial models of AR in VET.
5. Creation of a glossary to clarify the meaning of the term "applied research", and other terms related to R&D, in the context of VET.
6. Report on main barriers and enablers to engage SMEs in AR in VET.
7. Development of tools for VET staff and teachers' mind-sets for AR.
8. Creation of a framework for building the capacity of VET systems to work on AR projects.

### About the interview

In order to understand existing activities in the applied research in VET field, we will interview different stakeholders from various countries. The interviews will last approximately one hour and will be held in person or online according to semi-structured guidelines.

You may find the overview of topics below:

1. Organisation structure and activities
2. Value proposition
3. Research methods
4. Outputs and assessment
5. Resources
6. Context and policies
7. Funding and revenue streams
8. Engagement of SMEs and other stakeholders



We would like to use the insights from the interview for a mapping study. You may indicate in the consent form whether your institution would like to appear as a study case or not. The interview will be recorded (and transcribed) to help to accurately capture your insights in your own words. The recordings (and transcriptions) will only be used internally for the purpose of this study. Thank you for your cooperation.

### Benefits and risks of participation

Intangible benefits of your participation are to contribute to the prospective and pragmatic understanding of applied research in VET. Together with the other interviewees, your insights will contribute to improving opportunities and conceptions of applied research in VET in the context of your sector and in the European Union, developing mutual understanding between the different communities and, potentially shaping the way the EU addresses applied research in VET. No risk or inconvenience is foreseen. No direct personal benefit or payment is offered for your participation in this study.

### Privacy and confidentiality

You have the right to withdraw from the study at any time. In the event you choose to withdraw from the study all information you provide (including tapes) will be destroyed. Insights gathered by you and other participants will be used in writing a qualitative impact analysis report. Though direct quotes from you may be used in the report, your name and other identifying information will be kept anonymous.

### Contact persons

In case of any question, request, or complaint regarding your role as participant in this interview, you may reach out to us via email: [info@airinvet.eu](mailto:info@airinvet.eu)

By participating in the interview, you acknowledge that you have read and understood the information above. You are aware that you can discontinue your participation in the study at any time.



Figure 2 information and consent sheet for interviewees

This information and consent sheet explains the objectives and process of the interviews, and the use of its results.

The interviews were recorded to have a back-up file to record the information gathered in the interview results template.

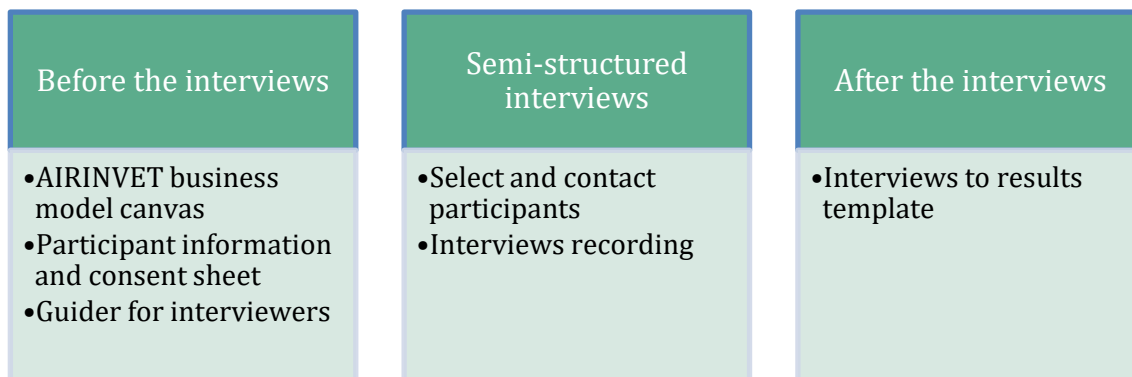


Figure 3 interviewing process and documentation.

## 3.3 Findings from the interviews

### Section 1: Organizational details, structure, and activities.

The survey carried out by AIRINVET partners in the project from April 2023 to October 2023 cannot be considered as a scientific study (the sample is somehow arbitrarily chosen, there is not a clear hypothesis,

the methodology is “relaxed”, and the questions and answers can be ambiguous): nonetheless the sample’s composition and its results might have a considerable significance to demonstrate best practices and weaknesses on the ground.

We contacted seventy-nine organisations and conducted fifty-two semi-structured interviews overall. Some were face-to-face, others online.

The research process covered twenty countries contacted and nineteen interviewed, out of which thirteen were European and six non-European.

COUNTRY	Cuenta de Region/County/Municipality
Australia	2
Belgium	1
Canada	4
China	2
Croatia	1
Estonia	1
Finland	3
Germany	9
Latvia	2
Malta	1
Netherlands	5
Norway	1
Portugal	2
Singapore	1
Slovenia	1
Spain	9
Spain	2
Sweeden	1
Switzerland	1
US	2

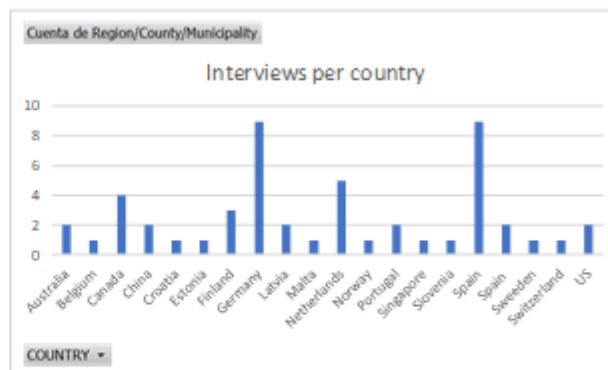


Figure 4 interviews per country

The survey covered 70% of the European Union as a whole (EU 27). The highest number of interviews were run in organisations based in Germany, Spain, Netherlands, and Canada.

The majority of the respondents have been characterised themselves as education providers, 81%.

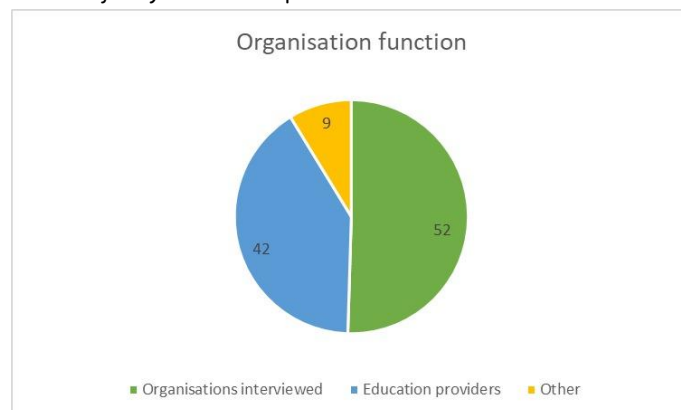


Figure 5 organisation function

The nine organisations that are not education providers can be gathered in four countries, Germany, Netherlands, Australia, and Singapore.

The education provider organisation type varies as well as the education levels offered. We have VET centres, community colleges, universities of applied science, companies providing education and other organisational types of education providers. The EQF level also varies among interviewees, and we can find from EQF1 to EQF 8 providers.

### **Section 2 and 3: Value proposition and Key activities and results (activities the organisations carry out in AR and their results).**

At the European level, a distinction exists between higher education organizations, such as universities of applied sciences, where applied research is a standard and systematically organised activity. This systemic approach also extends to the Canadian and Australian cases we examined. In each of these instances, there is a dedicated research centre, research area, or affiliated body tasked with conducting applied research. However, it's essential to note that these applied research activities do not exclusively revolve around or cater to companies' needs or development. In the Basque Country case, there is also a systemic organizational framework implemented specifically to address the needs of SMEs.

For organizations not primarily engaged in higher education, something prevalent in many of the interviews in European countries is that they did not have a clear understanding of the applied research concept. This meant that the interviewer needed to dig out the information in the interview. A prevailing finding in the European context is the absence of a systematic process for applied research within VET organizations.

Applied research in SMEs predominantly serves educational purposes rather than innovation objectives. There are exceptions, notably when collaboration with research centres occurs, or like in the Dutch case with the public-private partnership, which is a space devoted to these collaborations. As some interviewees highlighted, "Contract Applied Research for companies and SMEs is less common and only conducted upon request." Additionally, "some of our instructors, many of whom are self-employed and run their own companies, often act as consultants and provide various forms of support to companies."

In organizations engaged in applied research with companies, the active participants in projects typically include teachers. In the case of Canada and universities of applied sciences (UASes), it is commonplace for students in their later years to actively engage in research projects.

The outcomes of these research projects primarily have an educational focus, leading to the development of courses and learning materials. When conducted in collaboration with companies, the outcomes extend to prototyping, sampling, model tools or machines, and manuals. Additionally, reports, books, and articles are created for dissemination purposes, further enhancing knowledge sharing.

## Case studies

The type of case studies gathered also vary in type of organisation.

The case studies focusing on a direct service from a VET provider to a company are distinguished in the case of Canada, Australia, and Basque Country.

- 10 Canada
- 10 Spain; 7 Basque Country
- 3 Australia
- 4 Germany

The case studies of Germany show a direct service to create learning paths, materials and/or methodologies to use in the vocational training education. There are 4 different case studies showcasing this.

In the rest of the cases there are several examples from partnerships more than from an individual organisation. In those the role and activities carried out by the VET provider organisation are not clear. Among these we can find it is outstanding the case of public private partnerships in the Netherlands, and of European funded projects (CoVEs, Erasmus+, Horizon, and other) in other countries.

Regarding the sector in which these activities take place, the range is very wide, for instance, agribusiness, agronomy, aquaculture, textile and fashion, construction/tunnelling, manufacturing, healthcare, food and beverage, etc.

In some cases, they relate it to technologies (additive manufacturing, augmented & virtual Reality, big data, educational technologies, mobile and ubiquitous computing etc) or to general issues such as sustainability, social innovation, biotechnology, cybersecurity, urban greening, water, or target niche prospects within the general topics.

These makes difficult to define any finding regarding the sector that the case studies cover.

The geographical scope of the case studies is regional or national overall. There are some cases where international is mentioned but because the scope of the activity described (e.g. in European projects) is international, or the company activity is international.

Interview results are available in annex 1.

Case studies summary is available in annex 2.

## 4. AR POLICY CONTEXT

### 4.1 Mapping of Policies Supporting Applied Research in VET

The significance of advancing applied research within the realm of VET within Europe cannot be overstated in the 21st century. In an era where the European economy undergoes continuous transformation, the demand for highly skilled professionals across various sectors becomes increasingly imperative. Applied research in VET serves as a vital bridge between education and the dynamic labour market, ensuring that VET programs remain finely attuned to address the ever-evolving demands of industries and enterprises. It not only bolsters the employability of VET graduates but also nurtures innovation and contributes to economic growth by aligning vocational training with the latest technological developments and industry trends. Furthermore, the promotion of applied research in VET actively supports social inclusion and equity, catering to the diverse needs of learners, including those who hail from marginalised backgrounds. In a time marked by swift technological shifts and global competition, the support for applied research in VET stands as a strategic investment in the European workforce's future prosperity, competitiveness, and inclusivity. "Beddie and Simon note the potential to involve VET learners in such [applied research] projects, which will enhance learning and lead to a more innovative workforce (Beddie and Simon, 2017). However, involvement in applied research might be more applicable to higher-level VET rather than VET in general."<sup>2</sup>

### 4.2 European Landscape of VET Policy frameworks, supporting initiatives and Stakeholder Organisations

To comprehensively analyse the policies that underpin AR in VET frameworks in Europe, it is essential to encompass the pan-European framework, various declarations and recommendations on the European level, and stemming from the funding opportunities within the sector. The European Union actively bolsters the VET sector through various policies and supportive policy frameworks. The currently notable overarching strategy, spearheaded by the Directorate-General for Employment, Social Affairs, and Inclusion (DG EMPL), is "Skills for Jobs." Basing on the fact that the first principle of the European Pillar of Social Rights states that everybody in the EU has the right to quality and inclusive education, training and lifelong learning. Within this framework, the Vocation Education and Training Pillar is overseen through the commitment of countries to both provide and implement the policy via National Implementation Plans (in line with the 2020 Osnabruck Declaration). Additionally, support is extended through European initiatives, such as the establishment of Centers for Vocational Excellence.

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<sup>2</sup> [The future of vocational education and training in Europe | CEDEFOP \(europa.eu\)](https://www.cefop.europa.eu/en/publications/the-future-of-vocational-education-and-training-in-europe)

## Council Recommendations

A week before the endorsement of the further described Osnabruck Declaration, on the 24th of November, the Council of the European Union has adopted the Recommendations on VET for sustainable competitiveness, social fairness and resilience. As a general vision, the Council Recommendation emphasises the importance of integrating sustainability principles into VET programs. It encouraged EU member states to among others:

- Promote sustainability skills: Ensure that VET programs include education on sustainable practices, green skills, and digitalization to prepare learners for the modern job market.
- Collaborate with stakeholders: Foster partnerships between educational institutions, businesses, and other relevant actors to align VET with labour market needs and sustainability goals.
- Monitor and evaluate progress: Establish mechanisms to assess the effectiveness of VET programs in promoting sustainability and make necessary improvements.
- Support inclusivity: Ensure that VET opportunities are accessible to all, including vulnerable groups, to promote social inclusion and equal opportunities.
- Enhance the quality of VET: Promote high-quality VET programs that meet the evolving needs of the labour market and contribute to a more sustainable economy.

Regarding the research in VET, the only point tackling this particular issue was as follows:

*35. Supporting the Member States' efforts for the implementation of this Recommendation, strengthening the capacity of vocational education and training institutions, including their digitalisation and environmental sustainability and promoting research in VET at both national and EU levels through funding from the relevant Union funds and programmes (the Next Generation EU (Recovery and Resilience Facility and REACT-EU), European Social Fund+, SURE, European Regional Development Fund, InvestEU, Erasmus+, Horizon Europe, Interreg, Digital Europe, Just Transition Mechanism, the European Agricultural Fund for Rural Development, the Modernisation Fund);*

**Osnabrück Declaration - The Osnabrück Declaration on vocational education and training as an enabler of recovery and transitions to digital and green economies was adopted by ministers 6 days later.**

The Osnabrück Declaration, endorsed on 30 November 2020, is a commitment made by Ministers in charge of VET from European Union (EU) Member States, EU Candidate Countries, and EEA countries. It also involves the European social partners and the European Commission. The declaration focuses on shaping VET to support recovery from the COVID-19 pandemic and ensure transitions to digital and green economies. It emphasises the need for flexible, high-quality VET systems that adapt to technological changes and the job market. The declaration highlights the importance of lifelong learning, sustainability, and the international dimension of VET. It calls for cooperation among stakeholders, including social partners, to enhance VET excellence and relevance. The Osnabrück Declaration outlines specific objectives and actions for 2021-2025, recognising the pivotal role of VET in Europe's economic and social development.

The Osnabrück Declaration, endorsed on 30 November 2020, stands as a significant commitment by the Ministers responsible for VET in European Union (EU) Member States, EU Candidate Countries, and European Economic Area (EEA) countries. In addition to these key stakeholders, the declaration involves the European social partners and the European Commission. This pivotal declaration serves as a strategic framework for VET policy actions over the period 2021-2025, focusing on responding to the challenges posed by the COVID-19 pandemic and the imperative of facilitating just transitions to digital and green economies across the EU.

The context in which this declaration was forged is of utmost importance. The COVID-19 pandemic, alongside ongoing processes of digitalisation and climate change, has profoundly impacted European economies, employment dynamics, and societies at large. In light of these challenges, VET takes on an even greater significance, being called upon to play a multifaceted role. Not only does VET need to contribute actively to the post-COVID recovery, but it must also be at the forefront of preparing individuals and organisations to address broader issues such as demographic changes, digital innovation, sustainability, and the growing demand for STEM (Science, Technology, Engineering, and Mathematics) skills.

The Osnabrück Declaration recognises the evolving landscape of VET in Europe. It underscores its renewed importance in the context of the European Skills Agenda and the proposed Council Recommendation on VET. Through this declaration, the Ministers reaffirmed their dedication to contributing to the post-COVID recovery while advancing the European Education and Training Area. They do so by advocating for forward-looking and innovative education and training systems that support the digital and green transitions and enhance employability and competitiveness, thereby driving economic growth.

Notably, the Osnabrück Declaration emphasises that all policy objectives and actions outlined therein will be carried out with due respect for the principle of subsidiarity and in alignment with the specific circumstances of national VET systems. It highlights the critical role of strong partnerships with social partners, acknowledging that achieving the objectives set out in the declaration relies heavily on cooperation with stakeholders beyond governments and educational institutions. Additionally, the declaration commends the support and engagement of European-level VET providers' associations and learners' organisations, underscoring the collaborative nature of its approach.

In conclusion, the Osnabrück Declaration represents a comprehensive and forward-looking commitment by European stakeholders to elevate the role of VET in Europe. It recognises the challenges posed by the COVID-19 pandemic, digitalization, and climate change, and outlines a strategic framework to address these challenges. By fostering resilience, promoting lifelong learning, embracing sustainability, and engaging in international cooperation, the declaration aims to strengthen VET's contribution to economic growth, social inclusion, and the overall well-being of European citizens.

## **Centres of Vocational Excellence**



In response to the Recommendations and the Declaration described in the previous point, the European Commission responded to the needs by establishing various initiatives and funding streams. One of the main activities was setting the call for establishing the Centres of Vocational Excellence networks (CoVEs) across Europe.

Implementing vocational excellence is a prominent part of the EU's skills and VET policy. The European Skills Agenda, the European Education Area, the 2020 Council Recommendation on VET, and the Osnabrück Declaration all emphasise vocational excellence as a driver for VET sector reforms.

The Centres of Vocational Excellence (CoVE) initiative addresses this policy priority. It supports VET sector reforms to ensure high-quality skills and competencies that lead to quality employment and lifelong opportunities, meeting the needs of an innovative, inclusive, and sustainable economy. CoVEs also contribute to the success of the European Green Deal, Digital Strategy, and Industrial and SME Strategies, recognising that skills are crucial.

CoVEs operate within local contexts, creating skill ecosystems that drive innovation, regional development, and social inclusion. They collaborate with international networks of CoVEs in other countries, fostering a bottom-up approach to vocational excellence that involves a wide range of local stakeholders, enabling VET institutions to quickly adapt skills offerings to changing economic and social needs.

They offer training opportunities for both young people and adults, addressing the evolving labour market's demands during the green and digital transitions. They also boost local business development and innovation by partnering with companies, especially small and medium-sized enterprises (SMEs), on applied research projects and supporting entrepreneurial initiatives among learners.

These networks aim to promote VET excellence across the board, welcoming participation from countries with well-established vocational excellence systems and those in the process of developing similar approaches. This collaborative effort harnesses the full potential of VET institutions in supporting growth and innovation.

The initiative introduces a "European dimension" to vocational excellence by aligning with EU VET policy and actions agreed upon with member states, social partners, and VET providers.

### **EQAVET - European Quality Assurance in Vocational Education and Training**

The European Quality Assurance Reference Framework for Vocational Education and Training (EQAVET) was established in response to the 2009 recommendation of the European Parliament and Council. It serves as a European framework to enhance the quality of VET across Europe.

EQAVET operates on a quality assurance and improvement cycle, which includes planning, implementation, evaluation/assessment, and review/revision. It incorporates a set of descriptors and indicators applicable to quality management at both VET system and VET provider levels.

Rather than prescribing a specific quality assurance system, EQAVET offers a framework of common principles, indicative descriptors, and indicators that can assist in evaluating and enhancing the quality of VET systems and provision. It's akin to a 'toolbox,' enabling users to choose relevant descriptors and indicators for their specific quality assurance needs.

EQAVET aligns with the 2020 recommendation on VET for sustainable competitiveness, social fairness, and resilience. The VET Recommendation details how EQAVET can bolster the quality of initial and ongoing VET and presents the complete EQAVET Framework.

The EQAVET Framework is adaptable for use by VET providers and within VET systems to enhance the quality assurance of various aspects, including learning environments (e.g., school-based, work-based, apprenticeships), diverse learning contexts (e.g., digital, face-to-face, blended), both public and private sector VET providers, and VET awards and qualifications at all levels of the European Qualifications Framework.

In their national plans, countries prioritise different areas of reform based on their unique systems and circumstances. This briefing note outlines these areas of reform in accordance with the VET Recommendation, and it visualises how countries allocate measures to each of these priorities.

### **European VET stakeholder organisations (EVTA, EUproVET, EVBB, EFVET etc)**

“Over the last decades four European associations of VET providers have been active in projects, mobility, internationalisation in education and policy development ([EVTA](#), [EfVET](#), [EUproVET](#), [EVBB](#)). These four associations have been working mainly at the secondary VET level and have different orientations and objectives such as:

- training in companies versus schools and colleges
- initial to continued VET
- social inclusion to labour market relevance

In 2010 the European Commission was about to present the Bruges Communiqué, formulating the future of VET in Europe. The four associations decided to join forces to influence the policy content. The success of their collaboration led to a structural meeting with the European Commission. In that context two additional associations for Academic and Professional Higher Education were asked to join the discussions (eucen, EURASHE).

In 2014 all six associations agreed to work together under one umbrella. The organisations have kept their respective responsibilities and activities but have been working also for reaching joint objectives in assuring quality in VET and parity of esteem of VET in society. Also, progression from (H)VET to Higher Education is an important issue. All this in the interest of VET students, companies and the social and economic development in Europe.

The acronym VET4EU2 refers to the 4 network members of the platform that are mainly working in secondary VET plus 2 networks that work primarily in Higher Education”<sup>3</sup>.

[\[1\] Briefing note - Working together towards attractive, inclusive, innovative, agile and flexible VET | CEDEFOP \(europa.eu\)](#)

### 4.3 Country examples

In the following sub-chapter, the brief outline of the Country's policies and the functioning of the VET systems and the general frameworks that are driving the reforms and setting up the framework of VET will be given. Considering the aim of the ARinVET project to map out the particular aspect and inclusion of Applied Research in the VET systems, the aim is to review the broader VET frameworks and compare how this certain area is or is not directly addressed.

#### Spain & Basque Country

The functioning of the Spanish system of VET education is based on the newly approved [Organic Law on the Organisation and Integration of Vocational Training](#), which establishes and organises a single, integrated VET system which, while serving to strengthen the competitiveness and sustainability of the Spanish economy. The publication of the law culminated a long process of making VET a lever of change for economic growth, initiated in 2018. It was one of the milestones of the 2020 [Plan for the modernisation of vocational training](#) and has replaced the 2002 regulation and establishes a new VET model based on three main pillars: VET provision, validation of prior learning and career guidance.

Title VIII of the Organic Law on the Organisation and Integration of Vocational Training includes aspects of innovation, research and entrepreneurship, legally endorsing a situation that, for various reasons, has always been associated with the university environment. A good part of the processes of innovation applied research and knowledge transfer that allow the improvement of the different productive processes must reside and form a core part of vocational training and its centres.

The VET Modernisation Plan, the Recovery, Transformation and Resilience Plan and also Annual Employment Policy Plans make up the normative triad at the time of submission of the NIP that will guide the implementation of the planned measures for VET.

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<sup>3</sup> [About - VET4EU2](#)

*Below some of a direct reference from the Spanish National Implementation Plan<sup>4</sup> which link them to the applied research will be quoted:*

*"...need to support Applied research within the Digital and green transformation of VET Package, "...Regarding to the creation of classrooms for applied technology, it must be borne in mind that innovation and research in the field of applied research must be key elements in the new training model of VET in Spain."*

The applied research is also mentioned and supported by the Innovation and internationalisation of VET package within the framework. *"...With regard to innovation and knowledge transfer projects, it should be noted that innovation, applied research and knowledge transfer must be seen as key elements in the new model of vocational training in Spain. Economic revival and reindustrialisation by increasing the productivity of enterprises requires the promotion of innovation. Partnerships will be promoted between companies, vocational and any other training and innovation institution in different territorial environments with a planned annual line of 15,000,000 euros per year."*

### **6<sup>th</sup> Basque Vocational Education and Training Plan<sup>5</sup>**

In the Basque country, the policy plans mentioned before are supported by the new Basque Vocational Education and Training Plan, which marks a significant step in the Basque Government's strategic initiatives. Its primary goal is to enhance the Basque VETsystem, making it better prepared for the profound changes taking place in our society. These changes encompass intelligence, sustainability, and a compassionate approach.

The 6th Basque Vocational Education and Training Plan serves as the guiding framework for the transformation of the entire system. This process necessitates the adaptation of the system as a whole and the creation of a more ambitious and transformative plan than previous ones. This new plan is forward-looking but firmly rooted in the system's core components and strengths, which have been developed through the implementation of earlier VET Plans.

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<sup>4</sup> <https://ec.europa.eu/social/BlobServlet?docId=26329&langId=en>

<sup>5</sup> [https://www.euskadi.eus/contenidos/informacion/legelabur/eu\\_def/adjuntos/6PLAN\\_FP\\_eng\\_2022.pdf](https://www.euskadi.eus/contenidos/informacion/legelabur/eu_def/adjuntos/6PLAN_FP_eng_2022.pdf)

## Basque Country<sup>6</sup>

Public-private partnerships are the overall basis for financing systems VET projects in In the Basque Country, through collaboration agreements. The business transactions with companies involve releases by the Vice-Ministry of Vocational Training for teachers, invoicing without VAT, and public-private financing. Also, companies provide materials for the conduction of VET projects.

The Vice-counsellor of VET in the Basque Country promotes applied innovation in VET through the TKGUNE program coordinated by TKNIKA. This program aims to promote technological innovation in SMEs and transfer knowledge and competences to benefit them (by optimising and increasing competitiveness and productivity), their workers, teachers, and students, who profit from knowledge and competence acquisition. There are VET centres in the Basque Country participating in the TKGUNE program which follow diverse laws at different levels, including those set by the Vice-ministry of VET, the Spanish Government's Organic Law, and the European Commission's education framework, to ensure compliance with AR directions and frameworks.

Among the institutional barriers for AR in VET are the lack of hours, funding, and bureaucracy, which hinder its implementation due to resource constraints. At a macro level, VET centres report differences in policies and coordination across different regions in Spain (e.g.: Andalusia), while large communities may face challenges in effective collaboration and dialogue.

## Denmark<sup>7</sup>

Denmark's VET system is characterised by tri-partite governance involving the state, employers, and employees. This governance is underpinned by a legal framework, national qualifications standards, quality assurance procedures, and financial arrangements. Key aspects of the Danish VET system include:

**Social Partner Involvement:** The social partners play an institutionalised role in various aspects of the VET system, including curriculum development, the dual structure of VET, and VET monitoring at the national, sectoral, and institutional levels.

**Regulatory Framework:** The VET system in Denmark is governed by four major laws, each of which holds nationwide relevance and establishes the legal structure within which the VET system operates. These laws cover program goals, admission criteria, and organizational roles. The laws also address the

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<sup>6</sup> Results from the interviews conducted.

<sup>7</sup> <https://ec.europa.eu/social/ajax/countries.jsp?langId=en&intPagId=5611&parentCatId=1603&countryId=11>

minimum wage for apprentices, which is determined through collective agreements within specific trades.

**The four key laws shaping the regulatory framework for VET in Denmark are:**

- Vocational Training Act: This legislation outlines the fundamental framework for VET, encompassing objectives, admission regulations, and organizational responsibilities. It also defines the roles of advisory boards, companies, and Centres of Placement. Furthermore, it states that apprentice minimum wages are determined through collective trade agreements.
- Act on General Upper Secondary Exams in Connection with VET (EUX): This act focuses on pathways leading to dual qualifications as skilled workers and general upper secondary certificates, which grant access to tertiary education. It establishes the general provisions for teaching at the general upper secondary level within VET colleges, setting the groundwork for EUX programs.
- Act on Employers' Reimbursement Funds: This legislation ensures apprentices receive wages during the school-based phases of their VET programs.
- Act on Institutions of VET: This law sets the framework for VET colleges as self-governing institutions and outlines the roles and responsibilities of school boards.

Denmark set, in their National Implementation Plan, specific national level actions by 2025 for supporting “Vocational Excellence (CoVEs) and improve permeability between vocational and academic pathways, including work-based learning and enhanced cooperation between VET, HE and research centres, thus establishing quality and effective VET and apprenticeship programmes at EQF level 5 and above”<sup>8</sup>.

**Australia<sup>9</sup>**

AR in VET in Australia lacks a structured framework for research activities, time allocation, and recognition for VET teachers engaged in research efforts. VET teachers engage in research and collaborate with industry, however, not under a formal or recognised as official research, which increases the challenge of motivating staff to engage in research activities. The funding structure is marked by a lack of a systemic approach to research funding for VET, especially when compared to HE institutions.

Research and Development funding in Australia, particularly for VET, is perceived to be falling behind. The AR projects in the sector are primarily funded by industry and companies, indicating a strong partnership between educational and training institutions and industry. Their approach to smaller

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<sup>8</sup> <https://ec.europa.eu/social/main.jsp?catId=1603&langId=en>

<sup>9</sup> Results from the interviews conducted.

projects often follows a "just do it approach," emphasising a pragmatic and action-oriented stance, particularly in response to specific needs or opportunities. Collaborative projects between companies and VET institutions lack a standardised framework, including agreements on payment, contracts, and other operational aspects, typically negotiated on a case-by-case basis. An exception goes to government-funded projects carried out by private companies, where a stipulated portion of responsibilities and workforce (10%) must be carried out by trainees and apprentices, promoting skill development and practical experience in specific sectors like road infrastructure. HE institutions are considered the main centres for research in Australia, receiving grants and allocating paid time for academic staff to conduct research. However, there is a perception that research results from HE often remains unused.

### **Canada<sup>10</sup>**

Overall, the Canadian AR in VET policy context prioritises teaching and coursework. However, there is a growing involvement in AR, particularly through collaborations with industry, provincial funding, and federal research grants, although with a smaller share compared to universities. Colleges also focus on diverse educational offerings to meet the needs of various learners, including community support, vocational training, and micro-credential courses. The colleges above mentioned report that faculty members in Canadian colleges typically do not have research as a part of their job description, necessitating course releases through "buyout" arrangements.

In the case of New Brunswick Community College (NBCC), there is a specific policy concerning integrity, ethics, and intellectual property. Intellectual property is not retained by the college, aligning with the general Canadian college practice. The same college holds an industrial research chair in information and communication technology. Funding primarily comes from tri-council funding agencies like NSERC and SSHRC, with a significant focus on NSERC due to its alignment with science and engineering projects. Collaboration with industry, particularly SMEs, is prevalent, and the company often contributes to research funding. The province of New Brunswick and organisations like the NBIF Innovation Foundation also provide funding for research projects.

At Niagara College Canada and Camosun College, the focus is on community support, outreach, secondary education, trades training, and bridging programs for university transfers.

A significant portion of the Canadian population engages with colleges for both extended training programs and short micro-credential courses. Colleges in Canada receive a relatively small proportion (3%) of federal research funding, with the majority (97%) allocated to universities.

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<sup>10</sup> Results from the interviews conducted.

## Germany

In Germany<sup>11</sup>, VET is marked by a shared responsibility among the Federation, the Länder, and social partners. It's based on a cooperative and coordinated approach between workplace and vocational schools. The core principle of dual VET is to acquire vocational skills through organised training leading to a relevant qualification that ensures employability and connectivity to the job market, especially in the context of digital and environmental transitions. The flexibility and equivalence of vocational and academic education are key for lifelong professional development and securing a skilled workforce for the future.

[The National Skills Strategy](#)<sup>12</sup>, adopted in June 2019, was a collaborative effort involving various ministries, the Federal Employment Agency, Länder ministers' conferences, trade unions, and employer associations. It outlined measures to advance continuing education and training and foster a CET culture. A review of its implementation and objectives was scheduled for 2021.

The institutions and VET stakeholders operate under a balanced system of rules and funding, largely defined by law, such as Germany's Vocational Training Act and other related legislation.

Germany's 2021-2025 Coalition Agreement, titled "Daring to make more progress – an alliance for freedom, justice, and sustainability," outlines goals for innovation and climate-neutral practices. Investments in climate protection, digitalization, education, and research aim to modernise the state, economy, and society while offering improved educational opportunities, targeted continuing education, and increased labour market participation, including modern immigration laws to attract skilled workers.<sup>13</sup>

Dual VET in Germany is subject to legal regulations governing occupation profiles, the acquisition of skills and competencies, company-based and vocational school learning, youth protection, examination systems, and other standards. Germany's federal system grants individual states the authority to legislate on educational matters, leading to a complex mix of federal and state laws and regulations.

## Germany<sup>14</sup>

In Germany, dual VET involves shared responsibility between the Federation, the Länder, and social partners. Such shared governance emphasises a coordinated partnership between workplace and

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<sup>11</sup> <https://ec.europa.eu/social/ajax/countries.jsp?langId=en&intPageId=5619&parentCatId=1603&countryId=9>

<sup>12</sup> <https://www.cedefop.europa.eu/en/news/germany-national-skills-strategy-2019-review>

<sup>13</sup> [National Implementation Plan \(NIP\) Germany](#)

<sup>14</sup> Results from the interviews conducted.



vocational schools. The core principle is to provide vocational skills through organised training leading to a relevant qualification, ensuring labour market connectivity and employability. Promoting mobility between vocational and academic education creates lifelong professional development opportunities and attractive career paths while addressing the economy's skilled labour needs. Institutional roles and services are governed by a balanced system of rules and funding, primarily under German law, including the Vocational Training Act, Crafts Code, Upgrading Training Assistance Act, and Works Constitution.

## Netherlands

The Netherlands has an Agreement on National Steering Body for Practice-oriented Research SIA 2023-2028<sup>15</sup> since 15 April 2013, which “continues to promote the quality and impact of practice-oriented research by universities of applied sciences and also stimulates collaboration with other forms of research within the broad knowledge system (for example with research by universities, vocational institutions and T02 institutions)”.

The Higher Education and Scientific Research Act<sup>16</sup> states that UASs are “are focused on providing higher professional education. They perform design and development activities, or research focused on professional practice. They in any case, provide bachelor's programmes in higher professional education, they provide where appropriate, associate degree programmes and master's programmes in higher education vocational education and in any case, they transfer knowledge for the benefit of society”.

## Netherlands<sup>17</sup>

Collaborative innovation efforts and partnerships, often facilitated through Public-Private Partnerships are common within AR in VET in the Netherlands (e.g. CoVEs). The lack of specific policy mandates for innovation poses challenges, nevertheless, initiatives are emerging, such as practorates<sup>18</sup>, to integrate new knowledge and innovations into education and promote applied and innovation research within the VET sector.

Dutch VET centres hold a specific position within the education system, situated between secondary schools and UASs (EQF 6). Collaboration between VET and UASs are more common for EQF 5 levels. In

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<sup>15</sup> [Convenant by Ministry of Education on Applied Research \(mainly higher VET/ UAS\)](https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/convenanten/2023/07/06/convenant-sia-2023-2028/convenant-sia-2023-2028.pdf) <https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/convenanten/2023/07/06/convenant-sia-2023-2028/convenant-sia-2023-2028.pdf> and [Working agenda VET 2023-2027: https://open.overheid.nl/documenten/ronl-207c34db2672536cd275fb41e0aeaea9978892d1/pdf](https://open.overheid.nl/documenten/ronl-207c34db2672536cd275fb41e0aeaea9978892d1/pdf)

<sup>16</sup> [wetten.nl](https://wetten.nl) - [Regulation - Higher Education and Scientific Research Act - BWBR0005682 \(overheid.nl\)](https://wetten.nl)

<sup>17</sup> Results from the interviews conducted.

<sup>18</sup> Teacher-researchers, called practors, operate as mediators conducting and linking research with education practice. Practorates focus on development, integrating new knowledge and innovations into education, with some attention given to applied and innovation research related to educational fields.

the Netherlands, VET Centres at EQF 3 and 4 levels are not considered knowledge institutes comparable to universities, HE institutions, or research organisations like TNO. Such classification excludes VET Centres at EQF 3 from certain innovation structures and grant schemes for innovation. Similarly, SMEs in the Netherlands may lack awareness of the value of AR for their businesses, and it may not align with their primary focus of meeting job-related obligations, acting as a barrier to the adoption of AR in their operations.

Regulations related to energy and material transition play a significant role in facilitating research activities, providing opportunities for funding and collaboration, particularly focusing on local policies at the municipal and provincial levels. Despite the lack of specific policies to stimulate AR in VET Centres, the Netherlands is witnessing the emergence of the protectorates system, stimulated by the organisation Stichting Practoraten (foundation of practorates).

Other European countries interviewed in the project<sup>19</sup>:

### **Belgium (Flemish Community)<sup>20</sup>**

Collaborations for AR in the Belgium Flemish Community are established based on the strategic initiatives of the involved institutions. In this regional context, AR in VET faces challenges like job insecurity due to short-term contracts, difficulty balancing teaching and research duties, and the need for researchers to secure necessary resources. Despite these hurdles, UASs perceive VET education and research as relevant and applicable.

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<sup>19</sup> Belgium (Flemish Community), Croatia, Estonia, Finland, Latvia, Malta, Portugal, and Sweden.

<sup>20</sup> Results from the interviews conducted.

## **Croatia<sup>21</sup>**

The Croatian political context of AR in VET reflects lacks a specific national policy. Nevertheless, the National Smart Specialisation Strategy is the primary framework to guide innovation and research grants within the country. The strategy directs resource allocation and supports initiatives that align with national goals and priorities, effectively promoting innovation and research activities within VET.

## **Estonia<sup>22</sup>**

In Estonia, universities are the main performers of research at the EQF level 6, which reveals a dedication to aligning research with HE and specialised vocational training. Universities play a key role in this centralised approach to research, focusing on specific levels of VET, notably specialised vocational training, and bachelor's degree programs.

## **Finland<sup>23</sup>**

In Finland, the collaborations with vocational schools for AR are highly valued, emphasising their role as significant contributors to research and development, further enhancing the VET system and regional progress, which is reinforced by the National framework and legislation includes AR in VET, and favourable to enabling effective partnerships and policymaking within the VET sector. Institutions like HAMK and Metropolia play a vital role in education, research, and innovation, showcasing a holistic approach to AR. HAMK's legal mandate prioritises regional development, aligning research efforts with local growth needs.

## **Latvia<sup>24</sup>**

In Latvia, the political context of AR in VET varies at different educational levels. In high schools, AR is mandatory, with students conducting research projects that blend theory and practical application, aiming to develop research skills and critical thinking. Conversely, in VET centres, AR is optional and less actively promoted by teachers, though they are still required to integrate research-based work into the classroom. The Latvian approach underscores mandatory AR integration in high school education and a less emphasised but recognised role of AR within VET centres.

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<sup>21</sup> Results from the interviews conducted.

<sup>22</sup> Results from the interviews conducted.

<sup>23</sup> Results from the interviews conducted.

<sup>24</sup> Results from the interviews conducted.

## Malta<sup>25</sup>

VET in Malta is seen as a second-chance educational pathway, currently undergoing transformation driven by the Malta College of Arts, Science and Technology (MCAST). MCAST strategically emphasises excellence, quality assurance (QA), and trust-building, reshaping the perception of VET. The industry highly values MCAST students for their practical and hands-on approach. However, there is no specific policy targeting AR within VET. Despite this, MCAST, as the primary VET institution, works to influence frameworks for applied paths and advocates for increased investment in grants to enhance the VET sector and align it with industry needs.

## Portugal<sup>26</sup>

In Portugal, AR in VET relies on a mix of government funding and efforts to secure external funding, emphasising the need to diversify funding sources. The context has evolved through historical policy changes, expanding vocational education beyond professional schools. Challenges include insufficient funding, student preferences for traditional academic paths, and barriers to engaging in AR. Despite challenges, there's a strong commitment to enhancing student employability, with a generally positive perception of the VET sector and recognition of its economic impact. Proposed solutions include targeted funding models and increased collaboration with universities to address barriers and further develop the VET sector.

In vocational education in Portugal, even if it is not formally included in educational curricula, the Professional Aptitude Test (PAP) is recognised by the legislation that applies to professional schools. Students who are studying professional education dedicate their final year to developing this personal project, the PAP. Unlike a traditional "exam", the PAP is an ongoing exercise carried out throughout the final year of the course. It has an AR character, uniting and applying the knowledge and skills acquired during the course, both in the classroom and in the work environment. Student assessment is conducted by a jury made up of members representing entities external to the school, as well as internal members of the school<sup>27</sup>.

Polytechnic Universities are proven to be relevant promoters of Portuguese regional growth; however, due to recent economic challenges and limited funds, it is vital for these institutions to demonstrate how they benefit society and contribute to economic progress in their respective communities. Polytechnics were created "based on the assumption that they would constitute regional development agents (...), and their mission would be to develop more reproducible AR, with significant repercussions on economic and social development, thus playing an important role in the less-developed regions located throughout the inner strip of the country".<sup>28</sup>

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<sup>25</sup> Results from the interviews conducted.

<sup>26</sup> Results from the interviews conducted.

<sup>27</sup> [101719159.pdf \(ucp.pt\)](#)

<sup>28</sup> [The impact of polytechnic institutes on the local economy: Tertiary Education and Management: Vol 21, No 2 \(tandfonline.com\)](#)

## **Sweden<sup>29</sup>**

In Sweden, the political context of AR in VET is guided by policies promoting collaboration between VET and industry. The government prioritises industry-driven research to ensure that VET aligns with corporate needs and advancements. Policies offer incentives, such as grants and tax benefits, encouraging companies to engage in innovative projects within the VET framework. The focus is on promoting industry-relevant research that addresses current challenges and opportunities, aiming to enhance the effectiveness and relevance of vocational education.

Other non-European countries interviewed in the project<sup>30</sup>:

## **China<sup>31</sup>**

In China, the political context of AR in VET is characterised by substantial government investment aimed at improving the quality of education and skills training. This investment particularly focuses on enhancing the engineering skills of VET teachers, emphasising the pivotal role of educators in delivering effective vocational training. There is a strong emphasis on developing teachers' technical expertise and pedagogical skills to align with the evolving needs of industries. Additionally, the government promotes collaboration between VET institutions and SMEs, underlining the significance of industry partnerships in shaping vocational education. This collaboration involves initiatives like internships, apprenticeships, and industry-relevant curriculum development, aiming to bridge the gap between classroom learning and practical application in real-world work settings. Overall, these initiatives demonstrate a strategic approach to enhance the effectiveness and relevance of VET, addressing the demands of the evolving job market and supporting economic growth.

## **Singapore<sup>32</sup>**

In Singapore, AR in VET is characterised by a balanced involvement of the public and private sectors, with enterprises like Singapore and Spring actively engaging in projects, particularly in collaboration with SMEs. The projects focus on technological advancements and skill profiling, highlighting Singapore's commitment to align vocational education with evolving industry needs. This approach underscores a concerted effort to drive innovation and enhance skills within the vocational education framework, emphasising collaboration and relevance to support the country's technological progress and workforce readiness.

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<sup>29</sup> Results from the interviews conducted.

<sup>30</sup> China, Hong Kong, Singapore, and United States.

<sup>31</sup> Results from the interviews conducted.

<sup>32</sup> Results from the interviews conducted.

## United States<sup>33</sup>

The political context of AR in VET centres in the United States, on collaboration between educational institutions like Ivy Tech Community College of Indiana and York Technical College, and universities. The focus is on enhancing training and analysing curricula in domains such as Advanced Manufacturing, Engineering, and Applied Science. The collaborative approach aims to align curriculum with industry needs through AR and innovation, emphasising practical application and relevance. However, sustainable policies and funding are identified as essential for effectively supporting innovation projects. Advocacy for contextual understanding and prioritization of innovation in VET is emphasised to effectively align with industry demands. Overall, the U.S. political context highlights collaboration, curriculum enhancement, applied innovation, addressing funding challenges, and advocating for a prioritised focus on innovation within vocational education to align with industry needs.

## 5. AR FINANCIAL MODELS IN VET PROVIDERS

### Basque country<sup>34</sup>

In the Basque Country, as detailed by the VET centres interviewed, the funding sources for AR in VET come from the Ministry of Education (Innovation projects), EU funds (CoVEs), Caixa Dualiza, MEFP 2022-24, Bank grants (e.g.: Ibercaja), SMEs, VET Centres, City Councils (e.g.: Biscay Regional Council, Regional Council of Gipuzkoa, Eibar City council Tolosa's City Council and Urola Kosta Regional Council), Development Agencies and other public funds from regional and national governments. Overall, the major costs for AR in VET in the Basque Country involve materials, networking, training, and mobility. The funding primarily comes from SMEs, various levels of government, and regional councils, with a significant portion of costs being assumed by private company investment. Public funds from government entities play a crucial role in supporting educational innovation projects.

### Australia<sup>35</sup>

The financial landscape of AR in VET is influenced by various factors and programs and revolves around industry collaboration, limited financial support frameworks, administrative challenges, targeted grants, and the critical role of partnerships for successful research outcomes.

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<sup>33</sup> Results from the interviews conducted.

<sup>34</sup> Results from the interviews conducted.

<sup>35</sup> Results from the interviews conducted.

Funding for AR in VET primarily comes from grants, with higher education institutions being the primary recipients. There are specific grants available for VET-related institutions, such as projects promoting collaboration between VET and industry and projects focusing on regional innovation. These grants aim to encourage partnerships and innovation within the VET sector. The current financial support framework for AR in VET is limited, as indicated by the lack of an extensive framework for financial assistance. This implies that VET institutions may face challenges in securing financial support for their research initiatives. The administrative burden resulting from inadequate policies, or the absence of appropriate policies is identified as a challenge. This suggests that the lack of streamlined administrative procedures and policies can hinder the smooth execution of research activities in the VET sector.

AR in VET in Australia heavily relies on establishing and maintaining strong partnerships between VET institutions and industry. These partnerships involve collaboration with new innovation partners and development partners, emphasising the importance of fostering relationships to drive research initiatives and innovation within the VET sector.

### **Canada<sup>36</sup>**

AR in VET is funded by various agencies at the federal<sup>37</sup>, provincial<sup>38</sup>, and private levels<sup>39</sup>. Collaboration with industry, especially SMEs, is a common theme, and grant applications often prioritise student training and the development of highly qualified personnel. Funding structures vary but often require a portion of industry cash contributions (20%), with the specifics differing based on the funding program and institution. The core funding comes from the college, supplemented by operating grants (tri-council) and private funding, including fee-for-service arrangements.

### **Germany<sup>40</sup>**

The financial support for AR in VET in Germany typically kicks-off through essential initial funding, often from grants. Once the concept is validated and companies are onboard, co-funding by the company becomes an important resource for sustaining and advancing the AR initiatives. However, there is no comprehensive framework for financial support specifically tailored to AR VET.

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<sup>36</sup> Results from the interviews conducted.

<sup>37</sup> Examples of funding from federal organisations: NSERC, CFI, Fed Dev, CIHR, SSHRC.

<sup>38</sup> Examples of funding from provincial organisations: Ontario Centre for Innovation, NBIF Innovation Foundation.

<sup>39</sup> Industry partner contributions for research chair grants; collaboration with a significant percentage of small and SMEs.

<sup>40</sup> Results from the interviews conducted.

## Netherlands<sup>41</sup>

In the Netherlands, it is ensured that in the field of research and innovation, the MBO<sup>42</sup> is a full and equal partner in research and knowledge networks, pursuing the objective of safeguarding the proportion of relevant schemes and calls that include the MBO<sup>43</sup>. Each VET college can determine how to go about AR and additional services. One of the conditions of getting funding for this through the Regional Investment Fund VET (funded by the central government, 100 million for 4 years), is that the applications should be based on a co-created regional strategy, developed by VET providers, regional governments, and companies. Furthermore, the stakeholder should provide co-financing for the plans as well (1/3 national government, 2/3 by the partners, can be in kind as well).

Funding for innovation activities primarily comes from government grants, research involvement, including Public Private Partnerships and the Groeifonds (development fund) practices (funded initiatives that facilitate working on the development of educational activities within VET Centers), and lump sum financing designated for the VET Centres' (EQF 3 and 4) education tasks in the Netherlands. Additionally, integrating research activities within education programs allows for cost coverage through educational budgets. Such research projects are conducted by universities, UASs, and the business sector (manufacturers and others) providing additional funding and opportunities for educational development. Nevertheless, the customer payments for research activities consist of a relatively small stream and not a primary business model.

The Dutch Minister of Education, Culture, and Science signed in September 2023, a new draft regulation for the Regional Investment Fund MBO 2024–2027<sup>44</sup>, that dedicates an annual budget of €30.75 million, reaching a grand total of 123 million euros over its lifespan.

Other European countries interviewed in the project<sup>45</sup>:

## Belgium Flemish Community<sup>46</sup>

The financial landscape in the Flemish community for AR in VET involves a combination of fixed governmental support, external project-based funding, and revenue generated through client-funded services. These funding avenues collectively facilitate AR activities in the VET field. UASs receive fixed

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<sup>41</sup> Results from the interviews conducted.

<sup>42</sup> middelbaar beroepsonderwijs = secondary vocational education

<sup>43</sup> For more details see: <https://open.overheid.nl/documenten/ronl-207c34db2672536cd275fb41e0aeeea9978892d1/pdf>

<sup>44</sup> <https://www.wijzinkatapult.nl/nieuwe-regeling-regionaal-investeringsfonds-mbo-bekendgemaakt/>

<sup>45</sup> Belgium (Flemish Community), Croatia, Estonia, Finland, Latvia, Malta, Portugal, and Sweden.

<sup>46</sup> Results from the interviews conducted.



yearly funding from the government designated for research activities in the field of VET. This funding is flexible and can be allocated based on research needs and priorities.

Furthermore, VET institutions actively seek external funding through applications for National Research projects, Erasmus+ projects, and other international initiatives. However, the acquisition of external funding is challenging due to the relatively low probability of approval.

VET institutions generate revenue by providing services to companies. These services, often on a smaller scale, are separately funded by the client following a direct payment model. The revenue generated helps support AR in VET.

### **Croatia<sup>47</sup>**

The funding for AR primarily stems from Croatian national sources, particularly the Croatian Ministry of Education and Science. Collaborative projects are regularly initiated through calls from the ministry to encourage innovation through academia-industry partnerships. Algebra University College actively engages in these collaborations by partnering with innovative SMEs, typically forming joint applications focused on research and innovation. The primary goal is to facilitate technology transfer, converting research outcomes into practical applications. If successful, Algebra and its SME partners explore opportunities for technology transfer and commercialization of the research findings.

However, securing research funding poses a significant challenge for Algebra and similar institutions. The competition for resources is intense, involving highly specialised institutions and research universities drawing from the same funding pool. The presence of a dedicated research unit often becomes a crucial factor in this competition. Additionally, a notable disparity exists between public and private universities, with public institutions being favoured by granting organizations. This places Algebra, a private UAS, at a disadvantage. There is a suggested preference for separating funds for basic and AR to address these issues. Approximately 80% of Algebra's funding is sourced from national and EU funds, with the remaining 20% coming from private sources, particularly from companies.

### **Estonia<sup>48</sup>**

The financial landscape for AR in VET is characterised by existing national support schemes, primarily promoting collaboration between companies and universities. These schemes offer funding opportunities for businesses to conduct research with universities, but regrettably, VET institutions are often excluded from these programs. They are not considered viable partners within this framework. Earmarked funds are needed for specialised training programs aimed at VET teachers to ensure that educators are prepared and capable of actively participating in AR initiatives. Therefore, it is imperative to allocate funds not only for research but also for teacher training and development. This dual

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<sup>47</sup> Results from the interviews conducted.

<sup>48</sup> Results from the interviews conducted.

investment is crucial in creating an enabling environment that encourages meaningful collaboration between VET institutions and businesses, fostering AR in Estonia.

## **Finland<sup>49</sup>**

UASs experience reduced basic funding, compelling a heavy reliance on external funding obtained through various channels like EU funding instruments, as well as local, regional, and entrepreneurship funding.

UASs are increasingly prioritising research, development, and innovation over traditional teaching, leading to the hiring of highly educated individuals, often with doctoral degrees.

Both UASs and traditional universities face competition for funding, highlighting the need for additional support and resources to conduct effective research.

Institutions, especially HAMK, emphasise securing development funding, often through programs like Erasmus+, showcasing a stronger focus compared to traditional universities.

Collaboration on various projects, often of national, European, or international scope, is common and it involves a mix of funding from ministries, conversion RDI funding, and direct RDI allocation to larger companies and stakeholders. European structural funds play a vital role as funding sources for research, technology, and innovation (RTI) projects, further supporting the research landscape.

Particularly in the region of Helsinki, there are in place supportive ecosystem for project funding, including EU funding, local and regional funding, entrepreneurship contributions, and company investments, fostering an environment conducive to project development and execution.

In a nutshell, the financial context for AR in VET in Finland is marked by a transition towards research and innovation, a reliance on diverse external funding sources, and competition for limited funding resources. Effective execution of research, development, and innovation initiatives is facilitated through collaboration, access to various funding sources, and a supportive ecosystem.

## **Latvia<sup>50</sup>**

Funding for AR in VET in Latvia employs a varied approach to engage students in research endeavours. Some engagements are partnership-based, while others involve students through formal contracts. It is facilitated through special programs like the annual AR programs, offering both general and specific avenues for financial support.

Institutions such as Vidzeme UAS and Vidzemes Tehnoloģiju un dizaina tehnikums showcase a flexible approach to student involvement in research projects. This approach emphasises integrating students

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<sup>49</sup> Results from the interviews conducted.

<sup>50</sup> Results from the interviews conducted.

into research initiatives through a combination of partnership-based involvement and structured engagement via contracts.

At a broader level, the Ministry of Education and Science offers funding options primarily directed at research programs within higher education institutions. However, in the context of VET schools, including the mentioned institutions, there exists a knowledge gap where teachers lack awareness and time to explore funding options tailored for them. This gap hinders effective utilization of available funding opportunities for VET schools, underscoring the necessity for enhanced awareness and improved accessibility to funding options to advance AR within the VET sector.

### **Malta<sup>51</sup>**

In Malta, the financial context for AR in VET is tied to a competitive funding framework for research. Funding opportunities for AR are primarily sought at the national level, and lecturers consistently strive to secure funding for their research ideas, often with successful outcomes. A significant investment focus at the Malta College of Arts, Science and Technology (MCAST) is directed towards research hours. This emphasising the importance of capacity-building for researchers, highlighting a commitment to developing the skills and expertise of researchers. The aim is to enhance their ability to actively engage in and contribute to AR initiatives within the VET sector, underlining a commitment to the growth and advancement of AR in VET.

### **Portugal<sup>52</sup>**

The financing of AR in VET in the Portuguese context relies on a combination of funding sources. For example, the ETAP Professional School, primarily relies on community funds and state budget allocations, focusing on resource-intensive areas. Activities are funded entirely by a mix of community funds (around 85%) and state budget allocations (about 15%). Significant expenses are directed towards equipment, materials, and physical resources, with specialised areas like aircraft mechanics or automotive mechatronics incurring higher resource needs. Operating as a non-profit institution, ETAP doesn't commonly charge for services provided in partnerships, and partners may contribute materials for specific services.

On the other hand, the University Polytechnic of Setúbal diversifies its funding sources through projects (internal and external), international collaborations, internal funding initiatives, and collaborations with external entities, often involving active participation from teachers and students. Funding is obtained through various projects, both internal and external, often sponsored by the Foundation for Science and Technology (FCT) and covering a range of project natures. There is funding secured from international projects, especially those funded by the European Union, as Erasmus+. Some funding comes from the

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<sup>51</sup> Results from the interviews conducted.

<sup>52</sup> Results from the interviews conducted.

institute itself, although it may not always suffice to meet desired levels. Moreover, funding is sourced through collaboration with companies or external entities.

### **Sweden<sup>53</sup>**

In Sweden, AR in VET as described by Curt Nicolin Gymnasiet (CNG) is primarily funded through three main sources: own internal resources to fund AR projects, client contributions, and public funds earmarked for innovation projects. These funding sources drive advancements and improvements in VET through research initiatives.

Other non-European countries interviewed in the project<sup>54</sup>:

### **China<sup>55</sup>**

The Chinese context of AR in VET, as exemplified by the Wuxi Institute of Technology, is characterised by a financial structure of projects operating on a cost-sharing model. Each project typically sees about 50% of the funding provided by the public government, showcasing a significant contribution from the public sector. The remaining 50% of the project costs are covered by the participating company, emphasising a collaborative effort between the government and private entities to support AR initiatives in the field VET.

### **Hong Kong<sup>56</sup>**

The financial approach to AR in VET in Hong Kong, particularly as described by the context of the Technological and Higher Education of Hong Kong, differs from that of Singapore (described below). Hong Kong does not have a specific comprehensive funding framework exclusively for VET, and funding is allocated to diverse areas encompassing basic research, innovation projects within universities, and substantial portions are directed towards industry collaboration. This approach implies a blend of investments across various research domains, with a particular emphasis on collaboration between universities and the industry for AR initiatives.

### **Singapore<sup>57</sup>**

In Singapore the financial structure for AR in VET, particularly involving Research Fellows at the Institute for Adult Learning, is primarily centred around collaboration with SMEs. Government funding plays a pivotal role, covering a substantial 90% of the project costs. The remaining 10% of funding is generally

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<sup>53</sup> Results from the interviews conducted.

<sup>54</sup> China, Hong Kong, Singapore, and United States.

<sup>55</sup> Results from the interviews conducted.

<sup>56</sup> Results from the interviews conducted.

<sup>57</sup> Results from the interviews conducted.

contributed by workers or employees of the participating SMEs, emphasising a government-private sector partnership to advance AR in VET.

### **United States<sup>58</sup>**

AR in VET in the United States often relies on a combination of government funding, private sector grants, and student-generated revenue (tuition fees, etc) as exemplified by Ivy Tech Community College of Indiana and York Technical College. The National Science Foundation stands out as a significant government funding source, particularly in advanced manufacturing, engineering, and applied science projects. Additionally, private companies contribute to funding through grants, while some projects may lack dedicated funding streams.

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<sup>58</sup> Results from the interviews conducted.

## 6. Conclusion

The mapping does not show a special relation between applied research and VET. It seems that there are some activities that can be labelled as applied research, but they tend to be somehow anecdotal, in the sense that they do not tend to be systematised. Most of the activities mapped are not applied research according to the OECD definition, but non-teaching and learning activities that have some impact on innovation systems (at the local level). Many institutions are involved in research projects, funded by different programmes, which could also be labelled as applied research according to the OECD definition. However, it is not clear whether the specific role of VET in these consortia is research or other types of activities. It should be noted that many research projects include data collection or piloting parts that are not strictly research, but research-related activities. Participation in such projects, if the precise activity carried out by VET institutions is not specified, shows a closeness between research and VET, but does not necessarily show that VET is doing research.

There is also an ambiguity in the way applied research is understood. First, many do not feel at all close to the term and, although they have activities that could be considered close to research, they refer to them with other labels. Second, there are those who refer to any activity that is far from research (developing an app, designing training, updating a curriculum, etc.) as applied research. This creates confusing data. For example, there are those who consider their Erasmus+ projects to be research projects. Third, there are even those who consider that they work in applied research because they train their students in how to do research. This is a mistake; training someone in something does not necessarily imply that you do that something. For instance, I can train my students in industrial maintenance without having an industry and without doing any industrial maintenance myself.

We find more research-related activities as the EQF level rises. This is not surprising considering that research has traditionally been a university stronghold. This relationship between EQF and proximity to research, however, is not of necessity. It should be borne in mind that EQF refers to the academic level and research refers to a systematic way of generation new knowledge. This is proven by the fact that there are entities that are independent of training (and therefore do not have EQF) that do research.

In terms of the people involved in the activities included in the mapping, there is a variety. Some do it with their teachers, others with their pupils, others with mixed teams of teachers and pupils, others have dedicated staff.

What we do note is that wherever the activity of the VET institution has an impact on the innovation system, we are talking about multifunctional centres. In these centres, not all staff are exclusively dedicated to teaching. We note that, at least at the strategic level, the European Commission advocates

the creation of multifunctional centres (such as the CoVEs) and that many countries are taking steps in this direction. In this respect, there also seems to be an increase in the role of the teacher who teaches and does other things as part of his or her working day. In a previous deliverable (see glossary) we referred to this as "hybrid teachers".

We must also underline that this study (a) is far from exhaustive. Much more data and more representative samples are needed to be able to confirm what we have discussed in these conclusions; b) takes a snapshot of a constantly changing phenomenon: VET. We would not be surprised if the same mapping were to produce different results five years ago or in five years' time. There are also many open questions of the "what if" type. For example, what if we had done the mapping in other countries? What if we had adopted a more restrictive definition of VET? Etc. We are aware of these limits.

The main conclusions are that:

- VET has an impact on innovation systems, especially at local level, and should therefore be included and recognised as an important actor in the innovation system. It is important to note here that many of the activities we have mapped, while not research activities, are knowledge-related activities that have a direct impact on enterprises, especially SMEs. It is important to note here that many of the activities we have mapped, while not research activities, are knowledge-related activities that have a direct impact on enterprises, especially SMEs, and that this has a considerable impact on the innovation system. It is also an impact that universities and other classic actors in the research world are far from achieving.
- Apart from a few anecdotal cases, there is no research in VET if we understand it as "VET institutions doing research themselves".
- More studies about non-teaching activities with an impact on S3 carried out by VET centres are needed before we are able to talk about "applied research in VET" in a meaningful way.

## 7. References

- Bush, Vannevar. (1945): *Science, the endless frontier; a report to the President on a program for postwar scientific research*. United States Office of Scientific Research and Development.
- Chaminade, Christina; Lundvall, Bengt-Ake; Haneef, Shagufta. (2018): *Advanced Introduction to National Innovation Systems*. Edward Elgar Publishing.
- Edwards, J. M.-P. (2017). *Higher Education for Smart Specialisation: Strategic Partnerships for Regional Innovation*. European Commission, Luxembourg: Publications Office of the European Union.
- European Commission (July 2019): *Mapping of Centres of Vocational Excellence (CoVEs)*. ET working group on Vocational Education and Training (VET). SBN 978-92-76-09824-9 doi:10.2767/583401 KE-03-19-631-EN-N
- European Commission (2020), Council Recommendation of 24 November 2020 on vocational education and training (VET) for sustainable competitiveness, social fairness and resilience 2020/C 417/01. (2020). Official Journal, C 417, 1-16. CELEX: [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020H1202\(01\)\[legislation\]](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020H1202(01)[legislation])
- European Commission (2021). *Osnabrück Declaration on vocational education and training as an enabler of recovery and just transitions to digital and green economies*, Publications Office of the European Union. <https://data.europa.eu/doi/10.2767/784423>
- Fagerberg, Jan. (2005): "Innovation: A Guide to the Literature" in Fagerberg, Jan; Mowery, David; and Nelson, Richard (2005): *The Oxford Handbook of Innovation*. Oxford University Press.
- Foray, Dominique; David, Paul A.; Hall Bronwyn. (2009): *Knowledge Economists Policy Brief N°9: Smart Specialisation. The Concept*.
- Godin, Benoît. (2017): *Models of Innovation. The History of an Idea*. The MIT Press.
- Godin, Benoît. (2020): *The Idea of Technological Innovation. A Brief Alternative History*. Edward Elgar Publishing.
- Latour, Bruno (1998): *From the World of Science to the World of Research?* Science Vol 280, Issue 5361 DOI: 10.1126/science.280.5361.208
- Lundvall, Bengt-Åke & Borrás, Susana. (2004). "Science, Technology and Innovation Policy". *The Oxford Handbook of Innovation*. 10.1093/oxfordhb/9780199286805.003.0022



- Moso-Diez, M., Atwell, G., Gessler, M., Nagele, C., & Nardi, P. (2018). VET and Regional Smart Specialisation Strategies: A Comparative Approach. Trends in vocational education and training research, Vol. II. Proceedings.
- Navarro, Mikel; Retegi, Jabier. (2018): Los Centros de FP ante los Retos de la RIS3. El caso de Navarra.
- OECD (1997): National Innovation Systems. 2101733.pdf (oecd.org)
- OECD (2015), Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris, <https://doi.org/10.1787/9789264239012-en>
- OECD/Eurostat (2018), Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, <https://doi.org/10.1787/9789264304604-en>.
- Tatarkiewicz, Wladiyslaw. (2007). Historia de seis ideas. Arte, belleza, forma, creatividad, mimesis, experiencia estética. Tecnos/Alianza.
- UNESCO. (1989). Convention on Technical and Vocational Education. Paris.

## 8. Annexes

**Annex 1: Interviews results summary**

**Annex 2: Case studies collection summary**

## 8.1 Annex 1: Interviews results summary

Personalized interviewed organisations				
	COUNTRY	Region/County /Municipality	Organisation	Organisation weblink
1	Australia	Victoria, Australia	Victorian TAFE Association Team	<a href="https://vta.vic.edu.au/">https://vta.vic.edu.au/</a>
2	Australia	Victoria, Australia	Holmesglen Institute	<a href="https://www.holmesglen.edu.au/">https://www.holmesglen.edu.au/</a>
3	Belgium	Kortrijk	Hogeschool VIVES	<a href="https://www.vives.be/en/vives-international">https://www.vives.be/en/vives-international</a>
4	Canada	New Brunswick	NBCC - New Brunswick Community College	<a href="https://nbcc.ca/">https://nbcc.ca/</a>
5	Canada	Victoria, British Columbia	Camosun Innovates	<a href="https://camosun.ca/innovates">https://camosun.ca/innovates</a>
6	Canada	Ontario	Mohawk College	<a href="http://www.mohawkcollege.ca/ideaworks">www.mohawkcollege.ca/ideaworks</a>
7	Canada	Ontario	Niagara College	<a href="https://www.niagaracollege.ca/">https://www.niagaracollege.ca/</a>
8	China	Hong Kong	Hong-Kong Metropolitan University	<a href="https://www.thei.edu.hk/">https://www.thei.edu.hk/</a>
9	China	Binghu District	WXIT	<a href="https://english.wxit.edu.cn/">https://english.wxit.edu.cn/</a>
10	Croatia	Zagreb	Algebra	<a href="https://www.algebra.hr/visoko-uciliste/en/">https://www.algebra.hr/visoko-uciliste/en/</a>
11	Estonia	Estonia	Tartu Vocational College (Estonia),	<a href="https://voco.ee/">https://voco.ee/</a>
12	Finland	Helsinki	Metropolia UAS	<a href="https://www.metropolia.fi/en">https://www.metropolia.fi/en</a>
13	Finland	Hämeenlinna	Häme University of Applied Sciences	<a href="https://www.hamk.fi/?lang=en">https://www.hamk.fi/?lang=en</a>
14	Finland	Helsinki	Helsinki Business College	<a href="https://www.bc.fi/">https://www.bc.fi/</a>
15	Germany	Hamburg	HCAT - Hamburg Centre of Aviation Training-Lab	<a href="https://www.hcatplus.de/">https://www.hcatplus.de/</a>
16	Germany	Hamburg	Hamburger Institut für Berufliche Bildung	<a href="https://hibb.hamburg.de">https://hibb.hamburg.de</a>
17	Germany	Hamburg	Bundesinstitut für Berufliche Bildung	<a href="https://www.bibb.de/de/26480_michael_haertel.php">https://www.bibb.de/de/26480_michael_haertel.php</a>
18	Germany	Hamburg	Insitut Forschung und Betriebliche Bildung	<a href="http://www.ifbb.network">http://www.ifbb.network</a>
19	Germany	Hamburg	Nordmetall Arbeitgeber Verband	<a href="https://meinarbeitgeberverband.de/themen-news/nordbildung">https://meinarbeitgeberverband.de/themen-news/nordbildung</a>
20	Germany	Hamburg	Hamburg University of Technology	<a href="https://itbh-hh.de">https://itbh-hh.de</a>
21	Germany	Hamburg	University of Hamburg	<a href="https://www.ew.uni-hamburg.de/en/ueber-die-fakultaet/personen/schwalbe.html">https://www.ew.uni-hamburg.de/en/ueber-die-fakultaet/personen/schwalbe.html</a>
22	Germany	Hamburg	VET-Projekte	<a href="http://vet-projekte.de">http://vet-projekte.de</a>
23	Germany	Hamburg	ITB - University of Bremen	<a href="https://www.itb.uni-bremen.de">https://www.itb.uni-bremen.de</a> <a href="http://www.ifbb.network/en/about-us/">http://www.ifbb.network/en/about-us/</a>
24	Latvia	Latvia	Vidzeme University of Applied Sciences	<a href="https://va.lv/en">https://va.lv/en</a>
25	Latvia	Priekulji Parish	Vidzeme Technology and Design Vocational School	<a href="https://www.vtdt.lv/">https://www.vtdt.lv/</a>
26	Malta	Paola	MCAST	<a href="https://mcast.edu.mt/">https://mcast.edu.mt/</a>

27	Netherlands	Drenthe	Drenthe College / pratorate	<a href="https://www.drenthecollege.nl/practoraat-waterstof-in-de-industrie/">https://www.drenthecollege.nl/practoraat-waterstof-in-de-industrie/</a>
28	Netherlands	Amsterdam	Foundation: Every VET a pratorate (leder MBO een practoraat)	<a href="https://www.practoraten.nl/">https://www.practoraten.nl/</a>
29	Netherlands	Dordrecht	ROC Da Vinci College	<a href="https://www.davinci.nl/">https://www.davinci.nl/</a>
30	Netherlands	Dordrecht	De Duurzaamheidsfabriek (The Sustainability Factory)	<a href="https://www.duurzaamheidsfabriek.nl/">https://www.duurzaamheidsfabriek.nl/</a>
31	Netherlands	Amsterdam	ROC van Amsterdam and Flevoland	<a href="https://werkenbijrocva.nl/">https://werkenbijrocva.nl/</a>
32	Netherlands	Eindhoven	Summa College	<a href="https://www.summacollege.nl/en/">https://www.summacollege.nl/en/</a>
33	Portugal	Caminha	ETAP Escola profesional	<a href="https://www.etap.pt/">https://www.etap.pt/</a>
34	Portugal	Setúbal	Setubal Polytechnic Institute	<a href="http://www.ips.pt">www.ips.pt</a>
35	Singapore	Singapore	Singapore skills agency	<a href="https://www.ial.edu.sg/">https://www.ial.edu.sg/</a>
36	Slovenia	Slovenia	Solski center velenue	<a href="https://www.scv.si/">https://www.scv.si/</a>
37	Spain	Basque Country	CIFP Armeria Eskola LHII	<a href="https://armeriaeskola.eus/en/">https://armeriaeskola.eus/en/</a>
38	Spain	Basque Country	CIFP Tolosaldea LHII	<a href="https://tolosaldea.hezkuntza.net/web/guest_english">https://tolosaldea.hezkuntza.net/web/guest_english</a>
39	Spain	Basque Country	CPIFP Harrobia LHIPI	<a href="https://harrobia.net/">https://harrobia.net/</a>
40	Spain	Basque Country	CIFP Iurreta LHII	<a href="https://www.iurretalhi.eus/es/">https://www.iurretalhi.eus/es/</a>
41	Spain	Basque Country	CPIFP Oteitza LHIPI	<a href="https://www.oteitzalp.org/">https://www.oteitzalp.org/</a>
42	Spain	Basque Country	CPIFP Salesiarrak Urnieta LHIPI	<a href="https://urnietakosalesiarrak.com/">https://urnietakosalesiarrak.com/</a>
43	Spain	Basque Country	CIFP IMH	<a href="https://www.imh.eus/es/servicios-empresas/innovacion-mejora-tecnologica/red-tkgune">https://www.imh.eus/es/servicios-empresas/innovacion-mejora-tecnologica/red-tkgune</a>
44	Spain	Castilla La Mancha	CiFP Aguas Nuevas	<a href="http://www.cifpaguasnuevas.es/">http://www.cifpaguasnuevas.es/</a>
45	Spain	Aragon	Centro San Valero	<a href="https://www.sanvalero.es/">https://www.sanvalero.es/</a>
46	Spain	Castilla LA Mancha-Toledo	IES Condestable Álvaro de Luna	<a href="https://www.iescondestable.es/">https://www.iescondestable.es/</a>
47	Spain	Andalucía-Jaén	Instituto Fernando III	<a href="https://web.iesfernandoiiii.es/">https://web.iesfernandoiiii.es/</a>
48	Sweedden	Finspång	Curt Nicolin Gymnasiet AB	<a href="https://www.cng.se/">https://www.cng.se/</a>
49	Switzerland	Thun	Berufsbildungszentrum IDM Thun	<a href="https://www.idm.ch/">https://www.idm.ch/</a>
50	US	Indiana	Ivy Tech Community College of Indiana	<a href="https://www.ivytech.edu/">https://www.ivytech.edu/</a>
51	US	South Carolina	York Technical College	<a href="https://yorktech.edu/">https://yorktech.edu/</a>

## Interview results summary

### Organisation details

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Organisation name: VTA Victorian TAFE Association

TAFE – Technical and Further Education

Organisation website: <https://vta.vic.edu.au/>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)

The Victorian TAFE Association (VTA) is a not-for-profit organisation that informs, supports and represents the interests of the Victorian TAFE sector, including Victoria's 12 TAFE institutes, four dual sector universities.

Policy and advocacy for the VET sector.

Distribution channels: best way on informing the industry about the benefit of AIRinVET is Peer to Peer contact. Monetary value is important and prior for the industry and success stories coming from peer-to-peer communication channels have the biggest impact.

#### 2. Value proposition

Key policy changes allowing VET to engage in Applied Research.

Policy and advocacy – we are the trusted voice of the VET sector in Victoria. We conduct research, and harness and develop the collective capacity of our network to develop policies and advocate for impact when representing members at all levels of government.

Pam focuses on Policy and Research within the organization.

Collaboration – we facilitate collaboration between members, driving collaboration and best practice.

Victorian TAFE International (VTI) – we support members to provide quality vocational education and training to students both onshore and offshore.

Events– we bring the VET sector together to discuss and debate challenging issues and opportunities.

Workplace relations– we represent members in enterprise agreements and provide workforce relations advice.

Governance – we provide resources to assist member Boards maintain good governance policies and procedures.

Partnering with members and government – we partner for impact with members and government to deliver programs that strengthen members and benefit students.

### 3. Research methods

**Member Perspective:** differs from institute to institute and industry that they are working with. (Please refer to interview with Andrew Williamson from the Holmesglen TAFE organization)

**VTA Perspective:**

Contact with Peak Bodies (Chambers, Associations) and discussing industry needs.

Research and submission papers on Applied Research in VET (done in collaboration with the TAFE institutes, based on data from the TAFE institutes)

Multiple events (e.g. VTA State Conference)

### 4. Outputs and assessment

Outputs in submissions and publications. Please see the “Name it and Claim” it report.

Research Gateway – database of AIRinVET case studies

### 5. Resources

Peak Bodies

12 TAFEs in Victoria and 4 Dual Sector Universities

Policy makers

### 6. Context and policies

Context of Applied Research: higher education institutions are considered to be the main centres of research. They receive the grants, and their academic staff has time allocated (paid time) to conduct research. Many times, the result of the research sits on a shelf.

Academics are also sceptic about any kind of research coming from VET.

VET has no framework with regards to giving VET teachers time (allocating time) for designated research activities nor do they receive the recognition that is ample in the academic world. VET teachers do research and work with industry, but it is not codified (not officially named research). It is difficult to engage staff in this context.

There is no framework for financial support for AIRinVET.

There is no framework around how companies and VET institutions work on projects together (payment, contracts etc). All of this is set up on a case-to-case basis.

Exception: if the project is government funded and carried out by private companies (e.g road infrastructure), 10% of the responsibilities, workforce has to be carried out by trainees and apprentices.

## 7. Funding and revenue streams

There is no extensive framework for financial support for AIRinVET.

Mostly higher education institutes receive funding from grants. There are two smaller grants for VET related institutions WITIF (projects revolving around encouraging VET to work with industry) and RISTIF (Regional Innovation).

## 8. Engagement of SMEs and other stakeholders

SMEs and other stakeholders are engaged with by:

- Members of VTA (VET institutes that belong to VTA)
- Peak bodies (Chambers, Associations) -> this is the main communication channel directly between VTA and SMEs and other stakeholders.

Additional:

“Name is and Claim it” – advice for beginners in Applied Research in VET:

Work out what applied research is, codify it, name and then claim it. There are massive differences between academic research and research in VET. Create an overview and document your successes and failures and build on that.

Just a further thought from yesterday’s conversation – research in general is very higher education centric we need to change the conversation towards the value of applied research. Unlike HE academic research much of the applied research done by VET practitioners is *incidental* to their work it comes from the work they are doing but isn’t necessarily from a planned perspective – the question is how to make it *intentional* in their work; that is to say ‘built in’ not ‘bolted on’. I think it comes from providing time for reflection and evaluation, learning from their activities with industry, industry understanding and advocating applied research in VET for its economic and innovation value; changing the expectations of VET institutions regarding applied research; and the perceptions of HE as to the difference, place and purpose of applied research.

## Interview results summary

### Organisation details

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Organisation name: HOLMESGLEN

Organisation website: <https://www.holmesglen.edu.au/>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

TAFE funding vocational education and training sits on the state level.

In some other states there is only a single TAFE. Victoria – TAFE system has 12 TAFEs and 4 Dual Universities. 11 TAFEs are comprehensive (all sorts of disciplines), one TAFE is hospitality themed. There is focus on specialization (taking lead on certain disciplines)

We have a great deal of autonomy as a TAFE. We employ our own staff, our own board and own executive team.

In TAFEs Portfolio – three parts of international education.

- International Education
- Industry Engagement
- Centre for Energy and Infrastructure (Civil construction, work health and safety and, electro technology etc.)

Homesland has a centre for applied research and innovation. That was established after the trip in Canada in 2016.

#### 2. Value proposition

Monetary value proposition -> tunnel prototype case saved the involved industry partners 12 MLN dollars.

Research in tunnelling centre is based on prototyping – simulated tunnels above ground and we work with business/ industry to test things before they go into the real world environment: example – concrete rail tunnel and fit out with cable trays and the research was about titanium bolts holding the trays in place and putting them in and checking if they are strong enough .Discovered that the bolts were 1 cm too long. Enormous number of bolts but we worked out that the bolts were wrong and saved the business a “heap of money”.

Industry has told us that this has saved **12 million dollars already.**

Homesland has a centre for applied research and innovation.

We focus on having partners that can tell us – we have a problem to solve, and we work on it.



We do a lot of work in simulated spaces, nursing, age care, disability care using simulation. Health care for indigenous folk, Canada and Australia have indigenous populations and suffer from greater health issues than the white population and we are trying to address that (For us not without us) engaging with indigenous populations.

All of this had to have a practical outcome.

Plumbing area – build of small model houses and we are looking at the ways of how grey water and clean water can be used (using different coloured pipes) to show which water is going through which systems. And we take a look at what is working, what isn't working (pros and cons). We have done this with industry partners, and this has been rolled out across suburban Melbourne and **the effect is water savings.**

### 3. Research methods

- Prototyping
- Project
- Sampling

When we established the tunnelling centre we had a concept of the industry education city, (perforated campus). The industry needs to feel that this is their space.

Language is important for engagement.

### 4. Outputs and assessment

1) Output and assessments: SharePoint database of all finalized Applied Research in VET cases available to TAFE staff.

These include success stories and failures for future reference.

2) Outputs include prototypes (tunnelling) and Process improvements (plumbing), Interventions (fall prevention).

3) Books and articles (see the book example in the case studies) and manuals.

### 5. Resources

Office for Industry Engagement with a SharePoint drive that all members can utilize to analyse case studies within VET in Victoria. Case studies that have been documented. Success stories are needed for the industry.

Homes Glen offers faculty support to make teachers better researchers and build capabilities (this includes programmes for professional development), they also offer these types of trainings to other Tafes).

Many VET teachers have a good network within the industry, and they are the ones bringing in the contacts and then including students “in the mix”.

## 6. Context and policies

Intellectual Property stays with industry partner.

Admin burden – the bad policies or lack of policies is a challenge.

Applied Research depends on developing and restoring true partnerships between VET institutions and industry (new innovation partners, new development partners).

## 7. Funding and revenue streams

No systemic approach to research funding for VET. Within R&D funding Andrew stated that Australia is lagging.

Applied Research Projects are funded by industry, companies.

For smaller projects – there is a “just do it approach”.

## 8. Engagement of SMEs and other stakeholders

We have an amazing industry advisory group of industry representatives, and they guide our work, but we also spend a lot of time listening to the industry – what are your needs.

Enquiries – we sit down and enter ongoing conversations with industry, and they say – we need an environment where we can test, we need to lay 36 km of cable tray, we have never done that in this way before and can we work with you in your environment,

We do not use the 'r' word. (Note: research)

We do not call it applied research; we call innovation project.

The question is – is it going to work? We do not necessarily talk about the methodology with the industry and then it's us in the backend that do the academic piece.

We don't call it a "Faculty", is (note: terminology usage differs) so we call it a Centre. The head of the faculty is not called a dean, is called associate director.

Teachers are called trainers; students are called participants or workers.

Applied Research in VET needs to be codified and also reconnected to VET institutions.

## Interview results summary

### Organisation details

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Organisation name: VIVES University of Applied Sciences

Organisation website: <https://www.vives.be/en/vives-international>

### Interview results

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1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

EQF 6, LLL courses, short courses.

Besides research, contracts research or some small projects for companies, NGOs, and hospitals. (e.g., of contract with companies that pay for a researcher over three years).

Centres of expertise for research around the six major lines of Bachelor Education.

Previously one centre of expertise was smart technologies, and now they are separated into three different groups due to the huge potential and following the ambition to broaden the research groups since there is a lot of ongoing AR.

2. Value proposition

Promoting impact through the several spaces, expertise and resources to conduct research (e.g., several labs are organised around a certain topic, a drone lab, the largest collection of board games lab, and a simulation room).

3. Research methods

Wide range of methods as the range of research activities demands.

Projects followed the regime of first having desk research to see how things can be applied to the work fields, bridging research at the university level and then making it applied to the work fields.

Design thinking.

Citizen science involves the community and produces something out of the needs of the end user.

4. Outputs and assessment

Results: reports or tools that are available, and we try to collect everything in the repository that is provided by the KU Leuven (but not many peer-reviewed publications compared to universities).

More technical research projects very often produce a tool or a machine that can be showcased as a model for the work field.

Assessment of AR: the research projects are monitored every month to assess the progress and discuss the results, whether they are aligned with the requirements of the end-user and or the work field. This process allows to adapt solutions to emerging issues.

## 5. Resources

Human: mainly the researchers who are involved in projects from different research backgrounds. Some of the research projects work very closely together with the students, but it depends on the topic. Some fields of study equip students with more research methods and tools than others.

Technical: equipment, instalments/facilities (e.g., drone lab).

## 6. Context and Policies

Barriers: often short time contracts for researchers (more uncertainty), difficulty to balance between teaching and research activities. Researchers must invest effort in obtaining additional resources.

The external perception from UASs (in the Flemish Community context) is positive and sustained in the applicability of the education and research activities.

In the Flemish Community, it is very much up to the strategy of the institution to establish collaborations.

## 7. Funding and revenue streams

Yearly fixed funding received from the governments to allocate to conduct research.

Applications for National Research projects, Erasmus+ projects, and other international projects. Separately, there are the services requested by a certain company, for example, and those are paid independently by the client (often small services).

Efforts to get external funding with a low chance of getting approved.

## 8. Engagement of SMEs and other stakeholders

Companies, NGOs, universities, and other UASs in Europe and beyond (Asia and Africa).

A set of stakeholders with long-term collaboration, however, also engaging with researchers to make connections to get guidance on further possible partners to connect with according to the needs.

## Interview results summary

### Organisation details

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Organisation name: New Brunswick Community College

Organisation website: <https://nbccd.ca/>

### Interview results

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1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)

New Brunswick Community College (NBCC) is a public college operating since 1974 in the province of New Brunswick, Canada. Spread out over six campuses, the NBCC offers more than 90 programs. Around 4,700 full-time students, plus 6,000 part-time learners and apprentices, accounting for more than 10,000 study at NBCC. Applied research activities started about 11 years ago, when applied research at colleges was getting more popular all over Canada with engaging over 100 stakeholders – community members, businesses, students, faculty. Ever since, a research office was started with an industrial research chair in one of the sectors that was a priority sector for the province but also an area of college expertise.

2. Value proposition

There are two key goals for applied research at NBCC:

1. Serve the socio-economic needs of the province, helping businesses grow.
2. Enrich learning experiences for students.

They provide:

- **Staff expertise:** we will connect you with our expert instructors and researchers who will develop your ideas into an applied research project.
- **Student involvement:** you will work and network with creative thinkers whose industry-relevant skills make them qualified applied researchers as well as an excellent pool of prospective employees or volunteers.
- **Facilities and equipment:** your NBCC staff and student partners have access to the facilities and equipment used to support 90 programs on six campuses across the province.
- **Funding application capability:** we can identify appropriate funding agencies and write and submit research grant applications.
- **Administrative support:** we will produce reports for funding agencies and are always available to answer questions.
- **Other partnership potential:** we can connect you with other potential collaborators within our provincial, regional, and national networks.

### 3. Research methods

NBCC is not commercialising but helping the ideation, helping come up with ideas, prototypes, testing.

There are course-based projects, as part of the the business analysis program, marketing, or product development, where students come up with different solutions to a problem and bring those to the industry or community partner.

### 4. Outputs and assessment

Project differ a lot, could be 1-2 weeks to a couple of years. Internally, student engagement, faculty engagement, partners engagement, funding, number of projects is tracker. But very important is also to track the impact, the results. Sometimes this is difficult because not clear if/how companies make of the results. Not many resources for follow up. In the next grant, a position for this will be secured to track and to tell story, even a year after project.

There is no satisfaction follow up survey yet but would be useful.

### 5. Resources/ 7. Funding and revenue streams

Around 26 people work at the NBB Applied Research and Innovation office: research chair, research fellows, research technicians, students. All researchers are grant funded, the core team – director, manager, finance officers, administrative support, two industry liaison officers are funded by the college. Students are brought in as assistance. All programs have some form of work integrated learning, e.g., 6-8 weeks workplace. Student can have 4 month funded internships within companies. Often, they end up working for the company they did their internship at. Another fund for experiential learning such as applied research projects is CEWIL - Work-Integrated Learning.

### 6. Context and policies

When the office was established 11 years ago, policy on integrity, ethics, intellectual property was established. IP is not retained at NBCC (this is always the case for Canadian college, not Universities however).

NBCC holds an industrial research chair in information & communication technology.

A lot of funding comes through the tri-council funding CIHR, *NSERC* or SSHRC. Most colleges apply for NSERC since its focus is science and engineering. At NBCC they have many social projects, so SSHRC funds were important until NSERC also offered some social project funds.

Sometimes it is also the company that pays. 98% of the companies they work with are SMEs, most often micro-companies. For the research chair grant, there is a set industry partner contribution. Other funding comes from the province New Brunswick, e.g., the NBIF Innovation Foundation. Projects can cost up to 100.000 thousand and the funding is 80% and the company funds 20%. Funding is competitive but easier than in the beginning, also because of the big industry involvement.

## 7. Engagement of SMEs and other stakeholders

Many different stakeholders, community, sector associations.

Faculty members learn about experiential learning and applied research as problem-based learning as a teaching methodology during instructor development program (not training on applied research, it's training on how to teach – applied research as a way of teaching). That's how faculty engagement was gained. They are professionals from their fields and usually don't have research experience and are often not interested in that. They are passionate about teaching students and so they frame applied research as another form of teaching. A good way to engage students with real life application.

### Recommendations:

VET providers should look at what they are strong at (internal expertise of staff, infrastructure, equipment) and what the need is in the region.

The leadership needs to be on board and supportive.

Student engagement is key, enriching learning experiences for students. The team is encouraged to attend graduation ceremony because students mention how impactful the applied research project was.

### Challenges:

Hard to find the talent/people/expertise in some areas, for example cyber security research, because of the project nature, with no guarantee for the future. Faculty engagement can be difficult, because they are hired as instructors and not researchers and teaching hours have to be replaced.

Funding is always a challenge. Only 4% of funding comes to their region for both Universities and Colleges. Storytelling is very important to get the word out about the good work being done.

## Interview results summary

### Organisation details

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Organisation name: Camosun College

Organisation website: <https://camosun.ca/>

### Interview results

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1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

Camosun College is a public community college located in British Columbia, Canada. Around 5000 students' study on two campuses.

Camosun College hosts the applied research centre called Camosun Innovates since almost 20 years (<https://camosun.ca/innovates>) with a focus on advanced manufacturing. The centre operates for the college but also for the region British Columbia generally to support local SMEs, that don't have their own R&D.

2. Value proposition

Camosun Innovates does everything from ideation and design to prototyping, mostly in the field of advanced manufacturing. They do not compete with local business or industry, e.g., if a client comes in and wants to have some work done that could be done by a company in town, they will move the client to that company. No intellectual property is kept at Camosun Innovates.

3. Research methods

It always starts with a problem from industry, then trying to find solutions (cheapest, most practical) but often no off the shelf solutions. This is when innovation is needed, technologists and engineers will address the question to find a design and production solution that suits their needs. All the research methods are being applied (the ones mentioned in interviewer guideline).

4. Outputs and assessment

Different projects: <https://camosun.ca/innovates/applied-research>

5. Resources

12000 square foot facility with a lot of high-end equipment on campus. For example, one of the only water jet cutters in Victoria, one of the largest 3D printers on the island, one of the largest CNS machines (e.g., for cutting moulds), the largest scanning technologies in western Canada. Heavy



focus on computing, programming, CAT models, software. Full machine shop, full composites shop. Equipment crucial part.

12 full time work at Camosun Innovates, that includes administrative staff, engineers, and technologists as well as an education lead. Faculty staff is approached if their expertise is needed. Students are hired every term for projects. Every project has at least one student working on it, from the beginning to the end. Around 70% of the students end up working for the companies afterwards. Student groups from the engineering program are trained by Camosun Innovates.

## 6. Context and policies

Besides teaching, the college focuses on community support and outreach, secondary education, trades training, University transfer (bridge programs).

In Canada, around 70% of the population will have contact with a college for longer training but also short micro-credentials courses.

## 7. Funding and revenue streams

The space and core team is college funded. The other funds come from operating grants (tri-council) or private funding, fee for service.

The funding comes from the natural sciences and engineering grant for a 5-year technology access centre (TAC), 3500000 dollars per year. Other funding comes from the Canada foundation for innovation, for the infrastructure.

NCERC funds very attractive for SMEs to do large scale work for a small portion of the price (20% payment by company, 80% funded).

No funding from province British Columbia.

## 8. Engagement of SMEs and other stakeholders

Industry is the key partner, mostly SMEs with fewer than 10 employees.

Connections with federal trade organisation, foundation for innovation.

Companies approach Camosun Innovates directly and then there are multiple ways of working together. One way is fee for service work. A company comes with a problem and then standard rates are charged to do the work for them. A lot of work with the marine industry.

Many clients come because of the equipment access. Also because of the federal funding support.

Outreach activities to local companies, participation in events. Go to companies and offer services.

Concrete example of collaboration through active outreach: There is a company making a hot sauce in town, that was featured as one of the most up and coming businesses in Victoria and they need to begin automating their production so Camosun Innovates will analyse their production,

recommend off the shelf answers for their automation needs and if there are no off the shelf solutions, Camosun Innovates will design and built prototypes for the bottling process.

Challenges: Funding, personnel, space.

Biggest challenge is funding. Only 5% of the federal funding that goes to universities allocated to colleges.

Dealing with a variety of topics although focus on manufacturing sector. Hier and maintain employees is a major challenge, because colleges pay a much lower salary than the private sector.

Some vacant positions not able to be filled for several years now.

Space is always an issue, not enough shop space available.

Recommendations:

Ask yourself what the college capacity is, what are the areas where the college is well versed in research activities because of faculty group or other core activities. Camosun Innovates started with Sport initiative, originally funded to create measurement devices for athletes. That led to manufacturing.

There must be student capacity, close relationship with engineering program.

College support crucial.

## Interview results summary

### Organisation details

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Organisation name: Mohawk College, Ontario

Organisation website: [www.mohawkcollege.ca/ideaworks](http://www.mohawkcollege.ca/ideaworks)

### Interview results

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1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

Mohawk College of Applied Arts and Technology is a public college of applied arts and technology located in Hamilton, Ontario, Canada hosting 30,000 thousand students (40% international, 60% domestic) on four campuses. Mohawk offers two-year Ontario college diplomas, three-year Ontario college advanced diplomas, one-year Ontario college graduate certificates and four-year collaborative degree programs, the latter in association with McMaster University. Mohawk offers more than 130 full-time programs, apprenticeship programs and more than 1,000 continuing education courses.

Mohawk specialises in health science and engineering technology education and is the largest trainer of apprentices in Ontario.

The applied research activities at Mohawk's started out in 2009. The idea was driven by one faculty member and one student, who had a vision to do a project focused on digital health. Eventually, from that project the first innovation centre on health science was established (MEDIC). More innovation centres followed in the coming years – on additive manufacturing and energy and power. In addition to the innovation centres, there are several research labs on topics such as The Internet of Things, Center for Climate Change, Unmanned and Remote Sensing (Drones). They operate year-round and run by full-time administrative staff (e.g. former faculty staff).

In 2022, the Centre for Emerging Research Initiatives was established to help researchers that operate outside of the main innovation centre areas.

Mohawk College has two [Technology Access Centres \(TAC\)](#): mHealth & eHealth Development and Innovation Centre (MEDIC) and the Energy and Power Innovation Centre (EPIC).

A Technology Access Centre (TAC) is a state-of-the-art applied research and innovation centre, affiliated with a Canadian college or cégep, that provides companies with access to cutting-edge technology and equipment, as well as a multi-disciplinary team with the expertise to turn brilliant ideas into market-ready products.

TACs offer value-added R&D and innovation services to Canadian businesses—particularly small and medium-sized enterprises (SMEs)—to develop new prototypes, scale-up processes and solve unique business challenges. They also provide customized training for corporate teams to upgrade

technical skills, and de-risk the financial investment of implementing new equipment and adopting emerging technologies. They aim to generate innovation and productivity results, while enhancing the competitiveness of their industry partners.

There are 60 NSERC-designated TACs across Canada.

## 2. Value proposition

At Mohawk College, IDEAWORKS provides Canadian companies with customized applied research solutions and fills the space between research and solutions by delivering customized support to organizations.

As an active hub of applied research and innovation, they provide industry and community partners access to faculty and staff expertise, an inspired student workforce, exceptional facilities, and top technology. And, for Mohawk students, IDEAWORKS offers an environment that combines hands-on learning and advanced skills development.

Mohawk faculty, staff and students collaborate with industry partners to complete real-world projects, which are often funded by provincial and federal agencies. These projects aim to address specific industry needs and to provide small businesses and other organizations with access to the resources they require to become more productive, innovative, and competitive. The research centres are supported by specialized facilities that provide our partners with access to leading-edge equipment, technical know-how and training opportunities. Mohawk is recognized as a leader in applied research in digital health technology, additive manufacturing, and energy.

Letting companies test out new technologies before they invest in them. Hence, state of the art equipment is crucial.

## 3. Research methods

Depending on project – full applied research methods portfolio.

Creation of white papers, Product Development and Redesign, Prototyping, Materials Development and Characterization (additive manufacturing), testing and validation of new materials, process optimization, manufacturing and 3D printing, design, product and process optimization, AR/VR development, data analytics, etc.

## 4. Outputs and assessment

Every outcome is different but mostly technological outputs, hard science R&D, not that much business side. In average, 20 case studies per year.

Process: a series of actions or steps taken to achieve a particular end.

Products: an article or substance that is manufactured or refined for sale.

Prototypes: a first, typical, or preliminary model of something.

Services: the action of helping or doing work for someone, without leaving a physical product behind. Also includes program development, particularly for social innovation projects.

Performance evaluation with students. No process for assessment of industry partner cooperation.

Some assessment taking place in the frame of grant requirements.

## 5. Resources

The research centres are run year-round by full-time administrative staff (e.g. former faculty members), a general manager, technical staff. Students are hired to work on specific projects. The core team fluctuates between 40 to 50 people. Additionally, in average 350 students are employed to work on AR activities per year (biggest student employer of the college). Besides that, about 30 people are going through a independent research training for AR activities at the Centre for Emerging Research Initiatives, 12 are working on a small research project and two people are setting up research labs. The AR training was initially launched in 2019 as an in-person training (“Applied Research Skills Development Program”, 6 months with 3hours per week). However, this in-person was very cost intensive because faculty members had to be “bought out” for course releases. When the COVID-19 pandemic hit, the AR training was turned into a “Applied Research 101” two-hour own pace [online course](#). The course was launched in February 2023 and is open to anyone. Around 150 people have registered for the training. For Mohawk college employees the training is combined with mentorship by the Centre for Emerging Research Initiatives.

State of the art equipment.

## 6. Context and policies

Faculty members at colleges do not have research as part of their job description in Canada. This means that they have to be “bought out” for course releases.

## 7. Funding and revenue streams

There are different agencies that fund applied research in Canada. Many are federal organizations, such as the Natural Sciences and Engineering Research Council (NSERC), Mitacs, and Regional Development Agencies (Such as FedDev), or the Canada Foundation for Innovation. There are also provincial organizations that fund applied research, such as Ontario Centre for Innovation (OCI) or Alberta Innovates, and more. And occasionally there are smaller organizations (for-profit and not-for-profit) that grant funding for college projects.

IDEAWORKS at Mohawk College has received different kinds of fundings, mostly from NSERC grants, CFI (Canada Foundation for Innovation), Fed Dev (Federal Development Agency), Ontario Center for Innovation, IE (Innovation Enhancement grants), Industrial research chair, two Technology Access Centre grants (TAC), I2I grant, CCSIF (community and social innovation grant).

For equipment, maintenance, support: Canada Foundation for Innovation.

The core funding comes from institutional government grants, while some funds are project-based grants or envelope grants. The core grants and envelope grants enable the possibility to let AR projects to be granted within a week. All funding is around 25% - 50% industry cash. There also some Fee for Service contract research possible, without grant application.

Every grant application asks for student training and HQP (highly qualified personnel).

#### 8. Engagement of SMEs and other stakeholders

The demand for AR by Mohawk College is huge. Very attractive because Colleges do not take intellectual property, easy to work with, great equipment.

#### **Other interesting points:**

General structure of AR activities:

There is always a lead researcher (either faculty member or a manger), support staff, technicians, 2-4 students in part-time or full-time (as cooperative education/work placement à dual training).

A typical business development cycle for a new area of research can take 12-18 months.

#### **Problems/challenges:**

In general, funding agencies give 94-96% of research funding to universities and only 4-6% to colleges. In many grants not all occurred costs are eligible or can cover activities such as business development, grant writing, finance and operations, HR, paperwork, dissemination.

Grants for equipment big challenge because the equipment outdates quickly while grants are not awarded regularly.

Applied Research still new to College Culture (although operating since 2009) leading to competition for space (for equipment to be stored), assistance, IT resources from the rest of the College.

#### **Drivers/enablers:**

Having the ability to fail, innovation mindset, hands-on work, tangible skills for students very important. Tool to stay connected to your community. Economic development driver. Businesses have specifically set up their business in the College region. Great help for companies, even if a project fails ("well planned out failure"). Community of innovation, focus on knowledge sharing, less competitive.

## Interview results summary

### Organisation details

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Organisation name: Niagara College Canada

Organisation website: <https://www.niagaracollege.ca>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

Niagara College of Applied Arts and Technology is a public college in the Niagara Region in southern Ontario, Canada. The college has three campuses in Ontario and hosts around 12,500 full-time students and offers more than 100 post-secondary diploma programs. Around 291 faculty, 89 administration staff and 224 support staff work at Niagara College.

Niagara College started with applied research around 23 years ago, it was one of the first colleges to start. In 2006, NCERC asked six colleges to pilot applied research activities for three years. Niagara College was one of these. Since 2009, NCERC fund installed.

Besides teaching and applied research, strong international focus.

#### 2. Value proposition

Niagara College's Research & Innovation Division provides real-world solutions for business, key industry sectors and the community through applied research and knowledge transfer activities. We conduct projects that provide innovative solutions, such as producing and testing prototypes, evaluating new technologies, and developing new or improved products or processes for small- and medium-sized businesses. With funding support from various regional, provincial and federal agencies, students and graduates are hired to work alongside faculty researchers to assist industry partners leap forward in the marketplace.

- Take a leadership role in revitalizing the Niagara regional economy, while supporting community and economic development in Niagara, Ontario and Canada
- Enhance the productivity and increase the competitiveness of our local SMEs
- Support the creation of new jobs through successful applied research and commercialization activities
- Enhance the quality of our academic programs and professional development of college personnel
- Support the development of applied research skills of our students

#### 3. Research methods

Niagara College hosts four types of innovation centres important for the region:

1. Advanced manufacturing
2. Food & beverage
3. Horticultural & environmental sciences
4. Business & commercialization

Every project is done with industry partner. Different methods, idealisation, prototyping, testing.

#### 4. Outputs and assessment

Around 250-300 projects a year. About 2000 students are involved, as part of course based project or hired for project.

#### 5. Resources

Around 35 people (administrative, support staff, scientists) working at the applied research department at Niagara College. Students involved in every project, students have to know about research ethics, research integrity, they sign non-disclosure agreements, if necessary, they are taught in project management, presentation skills. Often students are hired by company afterwards. Teachers are hired for teaching, so teachers need to be buyed out to work on applied research project.

Different research labs in the different innovation centres.

#### 6. Context and policies

Colleges get only 3% of federal research funding, 97% go into universities.

#### 7. Funding and revenue streams

Funding depends on the type of project.

Federal funding (NCERC, Canada innovation foundation), provincial funding Ontario center for innovation project funding. Sometimes companies pay 100%. Often with operating grants. IRAP (industry research assistance program).

#### 8. Engagement of SMEs and other stakeholders

Companies come with problem, either these problems go into classroom as part of course (4 months) or applied research project with funding.



Niagara College is known in the region for applied research, companies reach out actively to college. College is on the board of chambers of commerce and industry clusters but no adds or so needed. More companies call than can be handled.

Mostly SMEs, sometimes startups but mostly companies at least operating 2 years and at least 2 people. Some bigger companies, but Universities more suited for them, sometimes collaboration between College and University.

#### Challenges:

Difficult to hire faculty members.

Attracting good people with soft grants with time limited contracts is difficult. Projects are often short time. A lot of overhead efforts with many students and staff coming and going. Proposal writing can be tiring and risky.

#### Enablers:

Important to have support from college management. Having good connections to industrial cluster.

Focus on the needs of the community, match it with what you are good in.

## Interview results summary

### Organisation details

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Organisation name: Technological and Higher Education of Hong Kong

Organisation website: <https://www.thei.edu.hk/>

### Interview results

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1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

There are different degrees:

- Apply degrees: They use a mix methodology, theoretical and practical time in companies (study & work). They focus on basic research (learning for industry) and the methodology they use is based in projects develop. Most of the studies are industrial ones.
- University degrees in specialties such as engineering, medicine, computing, pharmacy, among others
- They find it difficult to work on applied innovation from the ecosystem of VET centres. Its strength lies in the development of craft skills.

2. Value proposition

It is the university the one that works with applied innovation projects and the university itself proposes the themes or problems on which to innovate.

3. Research methods

Students are the ones who develop innovative projects, usually specialise in industry. It is a mix of training between college centres and training in companies. Teachers help with innovative projects in companies.

But there are not used to develop projects teachers themselves.

4. Outputs and assessment

They have not any assessment procedure and from their point of view, it has its difficulties to define the correct procedure.

5. Resources

The 80% of the innovation projects are develop by SMEs (considering SMEs up to 100 hundred employees). Teachers are in a constant contact with companies (as student providers) and they are the ones who proposes the challenges.

## 6. Context and policies

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## 7. Funding and revenue streams

There is no extensive framework in funding, they invest in base research, in universities innovation projects and the rest of the funding are forwarded to industry.

## 8. Engagement of SMEs and other stakeholders

SMEs doors are opened for VET centres, they are part of ecosystem (student providers, collaborative projects...)

## Interview results summary

### Organisation details

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Organisation name: Wuxi Institute of Technology

Organisation website: <https://english.wxit.edu.cn/>

### Interview results

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1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)
  - They offer 3-year high level technical degree. Cooperating with technical university of China
  - 8 schools related to mechanic engineering, automation robotic, electric engineering, management,
  
2. Value proposition
  - 2<sup>nd</sup> valued school of the province of Shanghai.
  - Teachers provide knowledge to employees, and they transfer it to the company.
  - Lectures and practical engineering, both.
  - Lectures 80%
  - Two large factories invest money + public funding (expenditures)
  
3. Research methods
  - The SME use to go to the VET centre, and they see the technological resources and knowledges that has the school. With that, the company takes ideas of what do they can do in their company and the collaboration starts.
  - The teacher is the one who takes part in the project, teaching to the company staff and then helping in the phase of the development of the technological improvement.
  
4. Outputs and assessment
  - The teacher helps SME making the project and they learn from it, then to transfer it to the students.
  
5. Resources
  - The programme is mostly funded by the government and the materials that are needed in the development is paid by the company.
  
6. Context and policies

- The government invests money in the engineering process of the teachers and the collaboration between VET and SME is known in the region.
7. Funding and revenue streams
    - Half of the project are funded by public government and the rest is paid by the company.
  8. Engagement of SMEs and other stakeholders
    - Offering innovative solutions to SMEs is the most engagement way for the SMEs.
    - They go to SMEs and show them what they have to offer, and in the same said, the companies visit the VET centre to see what technology they have.
    - It is very attractive for the company.

## Interview results summary

### Organisation details

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Organisation name: Algebra University College

Organisation website: <https://www.algebra.hr/visoko-uciliste/en/>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

Algebra University is a formally accredited higher education institution offering EQF levels 6 and 7 degrees. They specialize in digital technologies, offering software engineering, system engineering, data science, digital marketing, digital arts, and digital economy programs. Our work intersects technical sciences, social sciences, and art.

Regarding Algebra collaboration with companies and the community, we focus on what is often referred to as the "third mission" of universities. This involves collaborating with startups, SMEs, big companies, and the public sector to support the creation of an innovation ecosystem. Our researchers excel in data science and artificial intelligence and provide technical services to various government ministries. Additionally, they are running **university incubator that has supported numerous startup generations**. Our services extend to SMEs across different sectors, and we remain sector-agnostic.

Algebra University College operates as both a vocational education and training (VET) provider and a university of applied sciences, offering diverse educational services. Their educational portfolio includes programs aimed at upskilling and reskilling individuals, emphasising enhancing digital skills. Algebra annually trains approximately 15,000 students through these various programs, catering to individuals seeking to improve their digital competencies.

In addition to their higher education offerings, Algebra collaborates with secondary VET providers, specifically secondary schools that deliver vocational education and training programs. This collaboration focuses on supporting secondary VET schools in Croatia to strengthen their vocational education and training capabilities. However, it's worth noting that Algebra's primary focus is on secondary VET schools rather than extensive collaboration with other lifelong learning centers, as the latter is a more competitive domain.

#### 2. Value proposition

Algebra University College actively embraces the concept of the "third mission" of universities, which involves collaborating with the community, be it the industry or civil society. We are dedicated to fostering innovation and have established a robust ecosystem for this purpose. Our engagement extends to various entities:

1. **Startup Collaboration:** We work closely with budding startups, small and medium-sized enterprises (SMEs), and large corporations. We aim to support and nurture innovation within these organizations.
2. **Public Sector Support:** Given the expertise in data science and artificial intelligence, Algebra actively engages with the public sector. We offer technical services to government bodies such as the Ministry of Labour, Ministry of Interior, and Ministry of Agriculture. Our goal is to assist them in leveraging digital advancements for improved efficiency and effectiveness.
3. **University Incubator:** The oldest university startup incubator in the region has successfully incubated 15 generations of startups, comprising over 150 teams. This initiative is pivotal in nurturing entrepreneurial talent within our university community.
4. **Digital Transformation Services:** Our services extend to SMEs across various sectors. Notably, we take an agnostic approach to sectors, meaning we are well-equipped to support SMEs working in diverse fields such as tourism, healthcare, and many others.

Algebra's commitment lies in facilitating growth, fostering innovation, and providing valuable support to all community sectors, contributing to the digital transformation and development of various industries. Algebra University College collaborates with the public sector, including ministries and local/regional self-governments, on a contractual basis. Algebra actively participates in the tender processes by submitting proposals when these entities release tenders outlining their service needs. Upon acceptance of Algebra's proposals, formal contractual agreements are established to institutionalise the cooperation.

For Algebra's Startup Incubator, the university runs an annual open call, allowing startups to apply for the program. Notably, Algebra offers this program free of charge to the selected startups, fostering entrepreneurship and innovation within the community.

### 3. Research methods

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### 4. Outputs and assessment

Algebra University College utilizes various key performance indicators (KPIs) to measure the impact and success of its applied research (AR) activities:

1. **Publications Impact:** Algebra assesses the impact of its research through standard impact factors, particularly focusing on the publication records of the scientists involved in AR projects. High-value publications are considered a significant indicator of research quality and influence.
2. **Startup and Spinoff Creation:** Algebra tracks the number of startups and spinoff companies that are established as a direct result of their AR initiatives. This metric highlights the practical applications and commercial potential of the research conducted.

3. Intellectual Property Development: The number of patents and intellectual property rights registered is another important KPI. This demonstrates the innovative nature of the AR projects and their potential for long-term value and protection.
4. Repeat Engagement: Algebra measures the number of companies that return to the College each year for additional collaboration. This KPI reflects the satisfaction and ongoing value that external partners find in their engagement with Algebra.
5. Deep Tech Initiatives: Algebra evaluates its capacity to support initiatives in the deep tech sector. This sector specific KPI demonstrates the College's commitment to cutting-edge technologies and aligns with European innovation priorities.

These KPIs collectively provide a comprehensive assessment of the impact, relevance, and success of Algebra University College's applied research endeavours.

## 5. Resources

When considering opportunities for staff and individuals working within the field of algebra, both in classical and applied research, there exists a potential for professional development and scientific advancement. This potential extends to career growth driven by collaborative efforts and research outcomes. It's worth noting that traditional research approaches, often defined by various grants and programs, provide a fertile ground for such development.

In research assessment and impact measurement, it's essential to understand the methods and criteria applied to evaluate the influence and significance of research endeavours. This assessment process is crucial for recognising researchers' contributions and determining their work's broader implications.

## 6. Context and Policies

There is no National policy linked directly to Applied Research. The grant schemes typically fall within the realm of innovation and research. Notably, these innovation and research grants are often linked to Croatia's National Smart Specialisation Strategy, making this the primary policy framework relevant to these funding opportunities within the country. This framework guides the allocation of resources and supports initiatives aimed at advancing innovation and research in alignment with the national strategy.

## 7. Funding and revenue streams

the funding for these activities primarily comes from Croatian national sources, specifically from the Croatian Ministry of Education and Science. The ministry regularly releases calls for collaborative projects that aim to foster innovation through partnerships between academia and the industry sector. Algebra University College participates in these collaborations by joining forces with innovative SMEs, typically two or three of them. Together, they submit joint applications for these initiatives, which focus on conducting research with an emphasis on innovation. The ultimate goal of such research is to pave the way for



technology transfer, whereby research outcomes can be transformed into practical applications. If the research yields promising results, Algebra and its SME partners explore opportunities for technology transfer and commercialization of the research findings.

Algebra and other similar institutions face a significant challenge when it comes to securing research funding. The competition for resources is intense, with both highly specialized institutions like traditional research universities and research institutes all drawing from the same funding pool. Surprisingly, the main distinguishing factor in this competition is often whether Algebra possesses a dedicated research unit. Beyond this, another noteworthy issue arises when comparing public and private universities, regardless of their specific classification. Granting organizations tend to heavily favour public institutions over private ones, placing Algebra, a private University of Applied Sciences, at a disadvantage. **There was a clear favourable suggestion towards separating the funds for basic and applied research.**

Approximately 80% of Algebra's funding comes from national and EU funds, with the remaining 20% coming from private sources, particularly from companies.

## 8. Engagement of SMEs and other stakeholders

Our collaboration with the public sector, including ministries and local/regional self-governments, operates contractually. Here's how it works:

### **For Public Sector Services:**

- These entities typically release tenders outlining the services they require.
- We actively participate in these tender processes by submitting our proposals.
- Upon acceptance of our proposal, we formalize the collaboration through a contractual agreement.

### **For the Startup Incubator:**

- We run an annual open call for startups, providing them with an opportunity to apply for our program.
- The program is offered free of charge to the startups that are selected to participate.

This approach allows us to efficiently engage with the public sector and support startups looking to develop their businesses.

The startup incubator, previously mentioned, offers its services to startups free of charge, and this opportunity is open to all startups accepted into its program. Algebra finances these activities using various methods, including its resources. In cases where designated EU funds for entrepreneurship support are available, Algebra seeks to secure funding through these channels. However, in the absence of such calls, Algebra independently finances these initiatives.

Algebra has established partnerships with sponsors like MasterCard as part of a collaboration program. In this program, MasterCard and Algebra jointly fund support services for SMEs, particularly those in the tourism sector. MasterCard initiates calls for tourism SMEs to participate, manages the selection process, and offers these services to SMEs free of charge. The services provided include education, mentoring, and more.

Furthermore, Algebra is a member of a consortium selected to participate in one of the European digital innovation hubs, EDI (European Digital Innovation). This consortium, comprising Algebra and five other partners, successfully secured funding through a project under the European Union. The project, after finalising administrative procedures, is set to launch in the upcoming fall. Through this initiative, Algebra aims to support SMEs in various sectors, including prototyping, education, digital transformation strategies, networking, access to finance, and more.

The engagement of SMEs with Algebra is driven by the university's mission to collaborate with the local, regional, and national community. This mission commitment leads to various engagement initiatives designed to make SMEs aware of the services offered by Algebra. Algebra conducts more than 50 communication events, each targeting different segments of the industry sector. These events cater to specific SMEs or roles within SMEs, such as legal experts or financial officers. The university hosts physical and online webinars where SME representatives can interact with Algebra's experts and explore how digital technologies can benefit their businesses. Algebra's year-round, dynamic communication campaign ensures that stakeholders are well-informed about the range of services available to them.

## Interview results summary

### Organisation details

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Organisation name: Tartu Vocational College

Organisation website: <https://en.voco.ee/>

### Interview results

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1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

Notes: 3000 students, 3000 adult students (biggest school in Estonia). Training connected to cooperation projects. Cooperation with business through apprenticeships of students on EQF level 4-5. (University of Applied Sciences for Applied Research, EQF level 6).

2. Value proposition

Development projects within Erasmus + and Interreg, connected to cooperation projects.

Usually, projects are on a mobility basis (linked to English language courses)

Several cooperation projects, strategic cooperation KA2 and KA3.

COVE projects as well (mainly automotive area – Maintenance of electric, hybrid or hydrogen vehicles).

3. Research methods

No focus on applied science per say at the Vocational School --> “not like the universities do”

“Prototyping is not something that we do.”

“I can remember one example -> construction area and there is a complicated certification process when it comes to building materials, in this case for pre-built/made chimney. “

Students were part of the testing process of the pre-built chimneys (chemicals check-ups etc.)

Students and teachers were part of this, they built a chimney in our construction lab and were testing it (smoke, environmental aspect).

Process was initiated by the business that produces the pre-built chimneys.

4. Outputs and assessment

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5. Resources

Set up is present. The school has laboratories and labs that theoretically could be used for Applied Research.

## 6. Context and policies

Applied research is usually done by Universities (EQF level 6). Also, national support schemes exist for business to apply for funding to cooperate with universities. Usually, VET Institutions are not part of those funding schemes and are not considered to be viable partners.

If an applied research scheme would be developed between businesses and this institution, then special trainings for the VET teachers would be necessary.

## 7. Funding and revenue streams

Social funds and project funding but mainly with regard to mobility projects and KA2 and KA3 projects.

No possibilities to cooperation with businesses based on mandate. Do VET schools have the freedom to conduct Applied Research from a legislative point of view.

If it is a business of the business, and national money is not involved, then the cooperation is possible. Once we enter funding schemes, VET institutions will not usually be taken as a partner for Applied Research.

## 8. Engagement of SMEs and other stakeholders

Cooperation with business is a normal part of the vocational education. Students must go and do an apprenticeship in a company. This VET institution has many partners in the various business sectors. Entrepreneurs have a lot to do in regard of the training quality and content within the framework of apprenticeships.

Practical studies go on in schools, -> technical laboratories. Prototyping or developing (welding, 3d parts etc). There is a basis, technical basis to do for businesses but usually we do not do this kind of things. The equipment is there, connections with business are there but applied research is not something that happens.

## Interview results summary

### Organisation details

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Organisation name: Metropolia University of Applied Sciences

Organisation website: <https://www.metropolia.fi/en>

### Interview results

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1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

The Metropolia University of Applied Sciences offers courses issuing EQF 5 and 6 in engineering, business, healthcare culture and arts faculties. The schools core functions of Metropolia UAS are teaching, research, development and innovation, and business operations and international relations.

Research activities: 5 (multidisciplinary) innovation Hubs built around societal challenges (data-driven construction, smart mobility functional city for people, customer-oriented well-being and health services, and smart and clean solutions).

Ongoing around 100 research projects and roughly half of them are with companies.

A large university with several applied research activities in place, since RDI plays a considerable role and is emphasised in the Metropolis Strategy.

2. Value proposition

To solve real-life problems and needs of the companies by applied research having both technical and social objectives.

The value companies are willing to pay in the collaborations varies a lot depending on the length of the project. Around 5 to 10% of the total funding.

Together with stakeholders or dedication, fit better to the needs of the companies and society.

3. Research methods

Prototyping, concepts or processes, design-based methods (for facilitating the project execution).

Nearly to already from the very beginning of their studies, students do assignments for companies and internships and during their courses by lectures, guest lectures from companies and other stakeholders, building a sustainable process.

4. Outputs and assessment

Results achieved with applied research activities: it varies from project to project and there are some projects – some result in prototypes for companies, and others produce concepts or processes (e.g. of a project – Pick Slash – with SMEs (in total 100 participating) and it builds the project so that we help the

companies to apply new technologies in their current products and to develop their current products and businesses and built so that it is the students who, as part of their studies, then doing assignments for these companies, helping them out with applying new technologies of course instructed by the teacher and researchers).

For assessing the results, each project manager must report on a system database to understand whether the project has contributed to either to teaching or research, what has been achieved in terms of students and studies like how many of the students have been involved and whether has it been the whole class also, in terms of how many study credits have been produced, what type of new teaching material has been created, what type of new courses or study plans have been created so these are more of the teaching-related results, open Access publications, new products, services, and new processes, and to following up after the projects on the impact on the other stakeholders (e.g. citizens or companies). Moreover, there are people assisting the commercialization of the project results.

## 5. Resources

Human: sstudents (“there are no projects without students being one way or another part of part of the implementation”), researchers and teachers, and project managers who are not teaching, but are focusing on project coordination or project administration or communication. Most of the lectures are involved in research activities too. RDI specialists supporting in the project proposal preparation phase. People responsible for the publication process, communication plan, implementation of the communication plan, events, etc. support function, in total around 25 people.

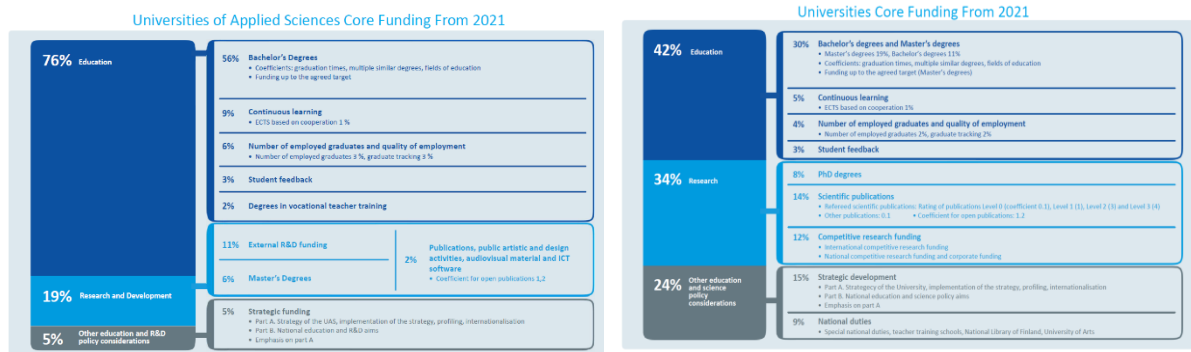
## 6. Context and Policies

In legal terms, the responsibility is on the regional development.

A considerable share of the funding coming from the Ministry, nevertheless UASs are encouraged to apply for external funding directly.

## 7. Funding and revenue streams

The funding for the University of Applied Sciences is very much dependent on the education results (see that 76% of the funding comes from Education in the figures below), then on RDR results, although, it has suffered a slightly modification, as now there is more emphasis on the RDI than in the past. The funding model is more dependent on the education and area and for universities on the other side around Education results and the 19 processes 19% from research, development and innovation, and then there's also 5% other funding and also from that other, it can be also allocated to RDI (see figures below).



At Metropolia, from the 100 projects ongoing, around 70% are national and 30% are European or international, which means the remaining comes from the Ministry funding and then the institution has the “so-called conversion RDI funding” where directly the RDI goes to bigger companies and other stakeholders.

Funding from the Ministry of Education is also dependent on the results which are not merely related to students, but to publications and RDI funding, external funding achieved through the projects, and the European structural funds play an important source of RTI funding.

## 8. Engagement of SMEs and other stakeholders

Ongoing around 100 research projects and roughly half of them is with companies.

Collaboration with other University of Applied Sciences and universities. The strategy is very much on strongly emphasising the working with companies and other regional stakeholders.

Most important sectors of work: engineering area, social and healthcare sector – companies, citizens, cities, and the students.

An advantage to work continually and in deep collaboration with certain partners, instead of having to build anything completely from scratch (including the relation itself).

## Interview results summary

### Organisation details

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Organisation name: HAMK

Organisation website: <https://www.hamk.fi/hamk-university-of-applied-sciences/?lang=en>

### Interview results

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1. Organisation structure and activities (include education level offered, e.g., EQF 3 to 6)

Hama University of Applied Sciences (HAMK) offers education at bachelor's and master's degree levels (EQF 6,7). In the framework of the Finnish framework of the University of Applied Sciences. And then, in addition to teaching and learning activities. HAMK also has a school of Professional education for teachers. HAMK also operates the School of Professional Teacher Education. The additional training is being offered through training for professionals who wish to become professional or vocational teachers. Universities of applied sciences are tasked to do research, development and innovation activities in Finland. So, in a way, both research and development are vital parts of HAMK's everyday business.

2. Value proposition

HAMK is actively engaged in activities with companies or associations. At the moment of the interview, a couple of projects are running where, for example, the competence needs of different industries are surveyed, or people from the industry are researching the future competencies needed. The funding on request usually guides the extracurricular activities outside of Learning and teaching.

HAMK's competence is based on four schools and four research units: School of Bioeconomy, School of Entrepreneurship, Business and Technology, School of Professional Teacher Education and School of Wellbeing. HAMK research units are HAMK Bio, HAMK Edu, HAMK Smart and HAMK Tech.

Examples of HAMK services:

**Research and development services** – Regional impact and customer-oriented applied research

We conduct applied research and bring together experienced experts and creative students for development projects. We operate in a multidisciplinary and project-based manner.

**Design Factory projects** – interdisciplinary product and service design

HAMK has a Design Factory. It is a product and service development environment that connects companies and multi-education students and teachers to work-based development projects. As a result of these, the company gets a concrete prototype of a product, service or concept. Design Factory equipment can also be rented for business needs.

<https://www.hamk.fi/design-factory/?lang=en>

**Industry-based student projects**



In student projects, you can solve a challenge related to the operation of your company. Student projects are done as a team-specific project and are implemented in different dimensions. There are many topics and areas for development, from the development of domestic operations to the possibilities of internationalisation.

Ask more from our heads of degree programmes:

<https://www.hamk.fi/heads-of-degree-programmes/?lang=en>

### 3. Research methods

Education research:

- Desk research on policies and competencies
- Interviews with industry representatives, school representatives
- Surveys

Workshops with invitation extended to various stakeholders from outside institutions.

Applied research unit – Focused on technology research.

- Virtual reality classes
- Simulations
- Shows and demonstrations

### 4. Outputs and assessment

-

### 5. Resources

Personnel – Both the people focused on teaching (Lecturers) and those focused on researching, initiating research with companies (Principal research scientists). This division is functioning on a strategic level of the institution. Based on the discussion with the management of the HAMK, the priorities are being set to underline the key activities to stream the resources in the prioritised way.

### 6. Context and policies

HAMK is designated as an integral part of national framework and activities related with research, development, and innovation activities, forming a crucial trio of functions. In addition to their educational role, HAMK is mandated by law to prioritize regional development. Specific sections of the legislation can be provided, if necessary, but these responsibilities constitute a central component of HAMK's core mission.

It was considered essential to mention that Finland is a relatively small country, making it easy to establish contacts with policymakers. The hierarchical structures here are not overly extensive, which allows for

more direct connections. In this context, people within the field tend to know each other and have interactions related to policy-making activities.

HAMK recognizes the pivotal position it occupies in these collaborations. Vocational schools often bring forth an abundance of research ideas and development needs, which HAMK is keen to support. Collaborating with these schools and jointly pursuing funding opportunities is a top priority. They serve as critical partners, and the research and development activities cannot thrive without their active involvement.

## 7. Funding and revenue streams

From the institution's perspective, the reduction in the basic funding for universities of applied sciences has prompted a heavy reliance on external funding sources. We often seek funding through various channels, such as U-level funding instruments. Notably, securing adequate financing has become a significant challenge.

Furthermore, regarding staffing resources, universities of applied sciences have actively recruited individuals with doctoral degrees. Traditionally, these institutions have primarily focused on teaching, and having staff with master's degrees sufficed. However, as the emphasis has shifted towards research, development, and innovation activities, along with pursuing external funding, the importance of employing highly educated individuals has grown considerably.

There seems to be a lack of sufficient support, particularly concerning funding. UAS competes with traditional universities for the same funding pool, which is inherently limited. This situation leads to increasing competition between universities of applied sciences and universities.

HAMK has traditionally placed a significant emphasis on securing development funding, exemplified by programs like Erasmus Plus. The institution recognizes the importance of ongoing development and innovation. Interestingly, this focus on development funding may not be as pronounced in traditional universities.

Moreover, traditional universities appear to be increasingly directing their attention towards development funding instruments. On the other hand, HAMK has also expressed a growing interest in securing Horizon funding. This dual approach, where both development and research funding are actively pursued, bolsters HAMK's research, development, and innovation endeavours.

Although we have distinct missions, we must still find ways to conduct research. This underscores the need for additional support in this regard.

## 8. Engagement of SMEs and other stakeholders

HAMK is actively involved in a range of activities, including collaborations with companies and associations. Currently, within their research unit, they are engaged in several projects. One of these projects involves surveying the competence needs of various industries and interviewing professionals

to determine their future competence requirements. Additionally, HAMK has also collaborated with several companies to enhance their learning opportunities in the workplace.

These activities are often closely tied to specific funding or projects, typically guided by funding calls through which HAMK secures the necessary financial support. It's worth noting that their engagements span both national and regional levels, particularly in their interactions with companies.

HAMK is actively exploring every available opportunity to advance its initiatives. However, a noteworthy observation is that in Finland, companies do not often demonstrate a strong inclination to allocate their resources to research and development activities. Consequently, when HAMK seeks collaborations with these companies, it typically involves a joint effort to identify suitable funding sources and collectively prepare funding applications. This collaborative approach assists companies in locating external funding options to enhance their activities.

HAMK maintains numerous personal connections that play a pivotal role in fostering collaboration. These collaborations are often centred around specific individuals or key personnel within partner organisations.

Furthermore, at the organisational level, when HAMK seeks to collaborate with vocational schools, a structured approach is adopted. Regular meetings are scheduled each year, typically in the spring, involving a two-hour session conducted through video conferencing or other team-based communication tools. These meetings serve as a platform for sharing ideas related to development and, occasionally, discussions about research priorities. They also provide an opportunity to deliberate on upcoming funding opportunities and related matters.

## Interview results summary

### Organisation details

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Organisation name: Helsinki Business College

Organisation website: <https://en.bc.fi/>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)

One higher education

VET school – 3 main programmes: Digital innovation, business and media technological programme. The biggest education and training in Finland.

Next to a University of applied innovation. Same campus, they cooperate a lot. Jouni worked 15 years on university on applied side and last 15 years working on secondary. In secondary, they make the same of university.

#### 2. Value proposition

Project funded by regional council: how to locate VET providers to local ecosystem. How to call their activities, they are starting. He works on that. They are more practical.

1. They are doing AR from projects, European union, local and national programmes. The topics they work on are business, digital innovation and media technological. The objective is the internal development.
2. How to develop the SME and the companies. Teachers and students involved on that.
3. Environmental issues, multicultural issues...

#### 3. Research methods

%50 teachers want to work with SMEs and %50 don't see the necessity to do that.

At the university same happens.

Projects comes from different people. They are specialised on innovation. They are 3 people on the team. RDI unit; AR activities and internationalization department.

Funding in the EU, regional and local, they know the policies and the contexts. Business and TIC informative, financial – those are the 3 different modules that they are expert on.

What kind of projects try to innovate? Entrepreneurship, sustainable development in very little companies.

#### 4. Outputs and assessment

There is a questionnaire on which the customer gives feedback of them. The incentive to applied projects is when the companies need them, so the feedback is the product. The challenges they face is very easy to see and very easy to find projects.

They need to connect with the working life.

#### 5. Resources

They have machines on the VET centre, and they don't buy any machine to make the project. They would like to have more infrastructures. They want to go to local ecosystem to ask about facilities.

#### 6. Context and policies

#### 7. Funding and revenue streams

#### 8.

EU funding. Also local and regional funding. Entrepreneurship or SME pays a little bit %20. Another company in Helsinki have the money to invest on this project. Good ecosystem to make projects.

#### 9. Engagement of SMEs and other stakeholders

Quite easy to find the collaboration.

There are two cases:

- A manager contacts this companies to find students internship. And they try to find projects.
- But generally, comes from the unit of Jouni, RDI. They are still small but really effective one. They have succeeded very well.

#### 10. A case study example

Digital innovation project COVE projects. There are research papers, and they did a good job. 2022 spring project. They got an excellent final result. They still continue with the project. They built a share point platform in COVE centres which gives service for VET providers. There are also news and event that happen in Europe.

There is also a learner platform, even for people which is not involved in VET centres or SMEs can use it. It is useful for everyone interested in cloud service. People can public their entrepreneurship and development and innovation topic.

It's a unic platform.

[www.dihubcloud.eu](http://www.dihubcloud.eu)

## Interview results summary

### Organisation details

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Organisation name: Hamburg Center of Aviation and Training

Organisation website: <https://www.hcatplus.de>

### Interview results

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1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)  
Network Organisation to enhance Companies In-House training, Cooperation Project with company to enhance up to date training and technology.

2. Value proposition

The Hamburg Center of Aviation Training-Lab (HCAT+) e.V. is the development network for future-oriented training and further education in the civil aviation industry in the metropolitan region of Hamburg, which with more than 40,000 employees is the third largest location in this industry worldwide.

In addition to the three large companies - Airbus, Lufthansa Technik and Hamburg Airport - this is thanks to around 300 suppliers and Hamburg's teaching and research institutions. In close coordination with the aviation cluster Hamburg Aviation, the HCAT+ forms the interface between education, research, business and the city of Hamburg.

Together with Hellermann Tyton they have invented a training unit to simulate a digital twin für welding machines.

HellermannTyton is a manufacturer and supplier of products for bundling, fastening, processing, connecting, insulating, protecting and identifying cables, wires and connectivity solutions for data networks. In addition, we develop products for customer-specific industrial applications.

Their mission is to develop real solutions around all cable management needs. In order to do justice to this, we deal day in, day out with everything, absolutely everything that takes place in the cosmos of our customers. They are our main inspiration in the development of our product lines.

They operate 18 manufacturing facilities and product development in 13 countries. More than 5,750 employees work at HellermannTyton in 39 countries.

3. Research methods

Mixture of Prototyping, Agile learning and testing

#### 4. Outputs and assessment

4.1 Trainers and researchers of HCAT and Workers of Hellerman Tyton

4.2 The technology has been delivered by HCAT

E-Learning how to implement VR in production processes, VR Environment to see the digital twin and H5p Videos to train with augmented content.

#### 5. Resources

This was a funded project by the German government, during the research and learning there had been an agile learning and training of company's workers conducted.

Barriers were given to convince the management to invest in new technology and learning concept for their workers.

The AR has brought sustainable effects to the company. The workers adapted the agile learning concept and are able to transfer aspects of this Agile learning process to complex future problems.

#### 6. Context and policies

Initial Funding of HCAT to develop the agile Learning concept for AR by the German government.

The adaption of the agile learning concept had been funded by the company itself and is a new way of combination of AR and Learning.

#### 7. Funding and revenue streams

The initial funding and inauguration is necessary to get the AR process running Once the company is convinced by the concept, the co-funding by the company is assessed as a valuable resource.

#### 8. Engagement of SMEs and other stakeholders

Sharing these results by publishing the AR and Agile learning concept in the Network of VET Stakeholder in the regional area.

## Interview results summary

### Organisation details

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Organisation name: Hamburger Institut für Berufliche Bildung

Organisation website: <https://hibb.hamburg.de>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

Hamburg's largest state government unit for vocational schools with around 3,050 employees of those 2,601 teachers at vocational schools, 283 employees in the field of educational and therapeutic specialists, technical and administrative staff, 169 employees at the HIBB headquarters  
 Organisation of (T)VET from EQF 2-6

#### 2. Value proposition

It is in charge of 30 state vocational schools around 45,200 students; of that 78 percent in the vocational training sector (EQF 4), 8 percent in further vocational training, 9 percent in training preparation (EQF2-3), 5 percent in courses to acquire a (technical) university entrance qualification (EQF4) and 1 percent of academic and vet education (EQF6)

The range of vocational schools is broad because it covers more than 240 professions in the dual system, opening up opportunities because dualized offerings at the transition from school to work improve access to training, and higher qualifications, among other things because higher educational qualifications can be achieved there before, after or during vocational training. The state schools are responsible for their teaching, personnel and organizational development, with the state and business being equally represented on the school boards.

#### 3. Research methods

Qualitative and quantitative Research approaches to reduce Youth employment (Jobstarter Project)

Design Based Research approaches to evaluate innovative vocational education measures.

Desk Research and literature review (for all research projects)

#### 4. Outputs and assessment

(vocational School) Empowerment and new approaches of learning teaching

Guidelines and reports for Vocational training schools to enhance their work in different areas.



5. Resources

Personal conducting research are usually hired teacher, paid trough research funding, by the state of Hamburg or through German ministries.

6. Context and policies

The HIBB belongs directly to the legal authority for schools and vocational training of the federal state of Hamburg.

7. Funding and revenue streams

The HIBB is completely funded by the state of Hamburg to run the vocational schools. Research and Projects are regularly funded by the German Ministries.

8. Engagement of SMEs and other stakeholders

To strengthen dual training, the federal government launched the Alliance for Training and Further Education at the end of 2014 together with representatives from business, trade unions, the Federal Employment Agency and the states. Together with the chamber of Commerce and Chamber of crafts it is in touch with many stakeholders around the metropol region of Hamburg.

## Interview results summary

### Organisation details

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Organisation name: Bundesinstitut für Berufsbildung /

Organisation website: <https://www.bibb.de>

### Interview results

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1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

Federal Institute for Vocational Education, Research in Nationwide vocational education and Training.

Together with experts from vocational practice, the BIBB develops and updates initial and advanced education and training regulations for recognised vocational qualifications. The range of regulatory instruments extends from training regulations for vocational education and training for people with disabilities through to advanced education and training qualifications at master's degree level. The regulatory work is based on academic research analyses with a vocational focus as well as on the evaluation of existing regulatory instruments. The BIBB uses implementation guides to support businesses in the implementation of high-quality training.

2. Value proposition

The BIBB monitors and examines vocational education and training at a European and international level. BIBB experts carry out research, development and consultancy tasks for this purpose. To support this, a network of approximately 30 partner organisations has been developed around the world. The German Office for International Cooperation in Vocational Education and Training (GOVET) makes the BIBB the point of contact for international collaboration in issues regarding vocational education and training. Other work also includes the analysis of vocational education and training systems in other countries, the expertise on the recognition of foreign professional qualifications, as well as supporting German providers of initial and continuing education and training in their process of internationalisation

3. Research methods

The BIBB uses its research to examine the ongoing and systematic developments and structures in vocational education training. Important topics, for example, are the situation in the training market, transitions into vocational education and training, competency development and the importance of continuing vocational education and training. Research instruments have been developed for this purpose such as the Labour Force Survey and the qualification panel, which are regularly used to

collect relevant data. The BIBB collaborates closely with universities and other research institutes in research, but also in teaching and in developing the next generation of academics. The Research Data Centre (BIBB-FDZ) provides access for external academics to the BIBB's research data.

#### 4. Outputs and assessment

The BIBB supports and advises the Federal Government and makes its expertise available to members of both the German Federal Parliament and the regional parliaments. Central to this are the articles in the Federal Government's Annual Report on Vocational Education and Training and the BIBB Data Report, which is published simultaneously. In providing this support and advice, the BIBB is at the same time fulfilling its statutory role. BIBB experts also provide advice at an international level, e.g., to the European Union and to governments and partner organisations around the globe.

#### 5. Resources

With the help of the BMBF, the BIBB funds future-oriented education and training concepts in the areas of career orientation, training management and continuing vocational education and training. For example, innovative projects for attracting and ensuring the next generation of workers are funded through the JOBSTARTER programme. As part of the career orientation programme, young people receive a practice-based insight into working life. Concepts for sustainable learning are encouraged and supported academically through pilot projects. The results of the work are prepared for transfer into practice so that all target groups are able to benefit from the solutions to problems and the innovation concepts.

#### 6. Context and policies

#### 7. Funding and revenue streams

BIBB is funded directly from the federal government budget and is subject to the legal supervision of the Federal Ministry of Education and Research (BMBF). Since 1999 its headquarters have been in Bonn.

#### 8. Engagement of SMEs and other stakeholders

## Interview results summary

### Organisation details

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Organisation name: Institute of corporate Education

Organisation website: <http://www.ifbb.network>

### Interview results

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1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

In many areas practice is ahead of science. Empirical analyses and studies only cover a narrow scope of work to a limited extent. Central areas of action-oriented research and action in digital transformation, such as digital competence development, the activities of further training specialists and the role of stakeholders, are blind spots in the research landscape.

2. Value proposition

One of the primary tasks of the IFBB is to link stakeholders in corporate training with science and with those involved in vocational and further training. This integration is implemented through the initiation of or participation in R&D projects, the think tank “Company Education” as well as through public relations and agenda setting.

The IFBB participates in publicly funded R&D projects and uses the Design Based Research (DBR) approach to practice-science communication, which is to be understood as a further development of action research. The research approach is particularly suitable for complex, largely undetermined developments and promises a high level of acceptance and impact in practice.

3. Research methods

Applied Design based research, formative evaluation of didactical settings.

4. Outputs and assessment

Report, , guidelines, Programme evaluation, Teaching concepts

5. Resources

The IFBB has an interdisciplinary team that research, designs and supports current developments and trends in in-company training and further education in research projects and the think tank's working groups. They are conducting vocational and applied research but uses a huge network of voluntary researchers from different stakeholders as think tanks.

With around 150,000 project managers, the Network of Practice is the largest inter-company community for L&D professionals in Europe. The practice-related community is confronted with similar challenges due to the digital transformation of corporate training. The network offers structures for communicative formative transfers and the direct exchange of practice-relevant experiences and insights in order to meet the diverse challenges of in-company training.

6. Context and policies

LLC which is independent company

7. Funding and revenue streams

Funded by German ministries, companies, and associations.

8. Engagement of SMEs and other stakeholders

There are a lot of stakeholders like companies, universities, schools and

## Interview results summary

### Organisation details

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Organisation name: Institute of Technical Education and University Didactics

Organisation website: <https://www.itbh-hh.de>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

The research and design of teaching-learning concepts in teacher training in the professional disciplines of electrical engineering, information technology, media technology and in the work studies/technology sub-degree program are central components and have a long tradition in the institute. The knowledge gained here was gradually transferred to new fields of action and research.

#### 2. Value proposition

Technological innovations, changes in professional structures and new teaching and learning concepts in the commercial and technical sector have been a challenge for vocational training and higher education for many years. What is new is the increasing speed of innovation and digitalization of technology, work and education. In the context of design and competence-oriented research, it is important to analyse the interrelationship between technology - work - education and to make it usable for educational processes. The research focus on technical education is therefore divided into three fields of action:

#### 3. Research methods

Qualification research and professional practice, Analysis, design and evaluation of technology, Analysis, and design of teaching-learning concepts

Expert workshops, Sector analysis, Work Process analysis, Competence profiling through expert validation workshops, Design based research, formative evaluation of didactical settings.

#### 4. Outputs and assessment

Scientific report, PHD thesis, scientific journals, guidelines, Programme evaluation, Teaching concepts

#### 5. Resources

About 10 researchers conducting vocational and applied research

6. Context and policies

University

7. Funding and revenue streams

Funded by the state of Hamburg. Research funding by the German ministries, companies and associations

8. Engagement of SMEs and other stakeholders

Hamburg Open Online University (HOOU)

SDG Campus Hamburg

Digitallearninglab Hamburg (DLL)

## Interview results summary

### Organisation details

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Organisation name: eScience Centre of the University of Hamburg

Organisation website: <https://www.ew.uni-hamburg.de/service/medienzentrum.html>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

The eScience office at the media centre offers advice and support for researchers in the Faculty of Education. It supports researchers by applying software and hardware in the research process, media production and use, data protection solutions, storage and archiving of research data or digital research infrastructures at the UHH.

It offers no training but supports but gives advice for applied science.

It has 5 Employees and is related to the faculty of education of the university of Hamburg.

#### 2. Value proposition

The eScience Office is responsible for the operational support of the digital transformation of the faculty's teaching, learning and research processes. This includes communication and coordination with central organizational units (HUL, RRZ, Digital Office), communication and coordination on aspects of digital teaching within the faculty as well as the organization and further development of the support and advisory services of the eLearning office.

The eScience also offers teaching in the areas of data literacy education, media education, educational media theory, and media pedagogy.

- Product owner with a focus on process development & innovation processes in the Lab for Hybrid Learning Spaces at UHH

- Development of a digital learning landscape for educational science as an innovation lab for contemporary teaching-learning processes

- Development and sustainable anchoring of a course offering to promote data literacy for teacher training students in cooperation with the LI Hamburg as part of DDLitLab.

- Member of the law firm "Digitality and Digitalization".

#### 3. Research methods

Qualitative and quantitative research Methods, Design based teaching research.

#### 4. Outputs and assessment



Scientific report, PHD thesis, scientific journals, guidelines, Programme evaluation, digital Teaching concepts for (vocational) teachers

5. Resources

4-5 researchers and teachers employed at the university.

6. Context and policies

Faculty of a University

7. Funding and revenue streams

Funded by the state of Hamburg. Research funding by the German ministries, companies, and associations

8. Engagement of SMEs and other stakeholders

House of the digital world (HddW), different schools and companies but no regular involvement, basically conducting Teacher Training

## Interview results summary

### Organisation details

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Organisation name: VET-Projekte

Organisation website: <https://www.vet-projekte.de/>

### Interview results

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1. Organisation structure and activities (include education level offered e.g. EQF 4 to 6)

“VET-Projekte” is a consultant agency for TVET Schools and represents the interests of the stat VET Schools in Hamburg.

The activities in AIRinVET ist broad and Distribution channels: best way on informing the industry about the benefit of AIRinVET is Peer to Peer contact. Monetary value is important and prio for the industry and success stories coming from peer-to-peer communication channels have the biggest impact.

2. Value proposition

Consultation of Educators in public VET Schools doing international projects on actual topics, like

Sustainability, Digitalisation, new technologies, collaboration and active research approaches in VET

Research and innovation: The consultancy supports educational institutions in integrating current research results and innovative approaches into their practice. This includes providing information on new pedagogical trends, conducting pilot projects and supporting the application of best practices.

Quality management: Consulting supports educational institutions in introducing quality management systems to improve the effectiveness and efficiency of educational processes. This may include developing quality standards, conducting evaluations and continually monitoring educational quality.

3. Research methods

Design Thinking Methods

Work Process analysis

Didactic approaches workshops

<https://www.designentrepreneurshipworkshop.org>

Sustainability Research in different topics Hydrogen

Contact with Peak Bodies (Chambers, Associations) and discussing industry needs

#### 4. Outputs and assessment

As usual a VET School

<https://www.designentrepreneurshipworkshop.org>

#### 5. Resources

Funded by projects and governmental Institutions.

#### 6. Context and policies

The consultation carries out a comprehensive analysis of the current situation of the educational institution in order to identify strengths, weaknesses and potential for improvement. This may include, for example, the evaluation of the educational programs, the learning environment, teaching methods and management.

#### 7. Funding and revenue streams

There is no extensive framework for financial support for AIRinVET.

Mostly VET-Projekte receives funding from grants.

#### 8. Engagement of SMEs and other stakeholders

SMEs and other stakeholders are engaged wither by:

- Members of VTA (VET institutes that belong to VTA)
- Peak bodies (Chambers, Associations) -> this is the main communication channel directly between VTA and SMEs and other stakeholders.

## Interview results summary

### Organisation details

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Organisation name: Institute Technology and Education

Organisation website: <https://www.itb.uni-bremen.de>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

The Institute Technology and Education (ITB) was founded in October 1986 and is a central scientific institution of the University of Bremen. With around 45 employees, it is one of the largest independent research institutions for vocational training in the world. The four departments of the institute are headed by professors from the departments 01 (Physics/Electrical Engineering), 04 (Production Engineering) and 12 (Educational Sciences).

#### 2. Value proposition

The emphasis of the ITB's vocational training research is the analysis, design and evaluation of the interrelationship between work, technology and education. It is anchored in six research fields: (1) Work and technology, (2) vocational skills research, (3) vocational learning and teaching, (4) pre-vocational education and transitions, (5) competency-oriented vocational training systems and (6) digital media in vocational Education.

The application areas of the department's research and development work are electrical engineering, information technology and building technology. Special focuses are on sustainable energy systems and energy efficiency. The basis for this is professional research results for identifying competencies in work processes, didactic approaches for developing the educational and qualification potential of work and technology, as well as findings on the user-friendly development and use of innovative media.

#### 3. Research methods

Expert workshops, Sector analysis, Work Process analysis, Competence profiling through expert validation workshops, Design based research, formative evaluation of didactical settings.

#### 4. Outputs and assessment

Report, PHD thesis, scientific journals, guidelines, Programme evaluation,

5. Resources

About 30 Researchers conducting vocational and applied research

6. Context and policies

University

7. Funding and revenue streams

Funded by the state of Bremen. Research funding by the German ministries, companies and associations

8. Engagement of SMEs and other stakeholders

Working Group Vocational Training Research Network (AG BFN)

Federal working groups for vocational training in the fields of electrical engineering, information technology, metal technology and vehicle technology. V. (BAG)

German Society for Educational Science (DGfE)

Working group for industrial and technical sciences and their didactics (gtw)

International Network on Innovative Apprenticeship (INAP)

International Research Network in Vocational Education and Training (IRN-VET)

European Research Network in Vocational Education and Training (VETNET)

Different Companies and German Ministries.

## Interview results summary

### Organisation details

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Organisation name: Vidzeme University of Applied Sciences

Organisation website: <https://va.lv/en>

### Interview results

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1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)

Circular Economy, Timber Construction and Digitalization within the Construction Faculty.  
EQF – level 5 (College) although the University itself also offers EQF 5 and 6, 7 and 8.

2. Value proposition

Projects in which students work on idea and concept generation working together with companies and/or institutions that match them with companies.

3. Research methods

Hackathons – businesses come with their challenges and students take active part in solving those challenges (idea generation)

Project work - Vidzeme Innovation Programme – in partnership with the Uni, students which are interested in solving challenges are placed in company related project work (please see Valmera Market example in point 8)

4. Outputs and assessment

Excel file with a couple of case studies should be sent through by 15.08

5. Resources

There is a base network with businesses that the Uni works with already.

The Uni tried to find peak bodies (e.g. Timber Federation) and get in touch with them so they can then spread the information about applied research opportunities amongst their members.

Head of Studies approaches businesses and offers involvement in student/business projects.

Sometimes if a more personal touch is needed, then the person that has access to a certain network will invite businesses.

6. Context and policies

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## 7. Funding and revenue streams

For projects in which students take part it – it is a mixed approach, some are more partnership based and in certain projects students have contracts.

Special funding programmes – once a year funding programmes for Applied Research. General programmes.

## 8. Engagement of SMEs and other stakeholders

Business can either come to the Uni directly or take part in Hackathons.

The Vidzeme Innovation Programme which collaborates with the Vidzeme University also has a network of businesses and these businesses turn to the Innovation Programme Leaders with projects/ideas. The students then solve the businesses challenge (the duration of this process is around 3 months).

Example Valmera Market – students should redo the market in a contemporary manner, strategizing development plans etc. communication with the client and looking at this from the construction point of view with focus on circular economy.

Vidzeme Uni of Applied Sciences also collaborate and involve students from other education institutions (e.g., Vidzeme Design and Art School).

Barriers of developing Applied Research: general relation between higher education institutions and businesses – finding partnerships.

Businesses want to monetize. Finding the balance between added value products (innovation). In business it is being the competitive one with the lowest price. It is not about added value products but it's about monetization.

It is not easy to open up about questions and issues that the businesses face. We have students who might be working at the competitors' companies. There is a level of insecurity.

## Interview results summary

### Organisation details

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Organisation name: Vidzemes Tehnoloģiju un dizaina tehnikums

Organisation website: <https://www.vtdt.lv/>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)

The institution used to have agriculture and mechanical focus, later woodcrafts as well. Last 20-30 years low reputation as VET is linked to a lower reputation in comparison to higher education studies. In recent years rebranding, two schools joined together. Rebranding of VET in that region. 19 professions, 900 students, 90 students, adult education for agricultural and mechanics.

3 months apprenticeships in 3<sup>rd</sup> and 4<sup>th</sup> year in SMEs mostly.

In IT, students write qualification work, but they also do a set of practical work which is usually linked to innovation (example in the value proposition area).

Focus in the last two years on the Erasmus Programme.

#### 2. Value proposition

Car mechanics, diagnostic centre has been established – where companies are invited and can come and give lectures to their employees and teachers from the school are also invited to these lectures. The companies need space for premises to showcase innovations and new technologies. Companies use the school's premise for these trainings, and it is a win-win situation as teachers learn about the industry on the spot. Usually, students are not present.

Employees of the car company come to the school to receive training in specific car related qualifications (theory and practical element). The criteria of these qualifications are given by the state, and it does not normally happen that the employees bring in problems/ issues, ideas from the company. This is mainly on an education basis.

IT apprenticeship overview: mandatory apprenticeships can lead to innovative solutions, in the case below two students that did their apprenticeship in an IT company helped the owner to develop a startup:

About the apprenticeship product, [www.bitbox.lv](http://www.bitbox.lv), two 4th year students developed the digital platform at Ltd. "Bitbox 28", plus made the marketing activities with videos, photos etc. (Instagram, TikTok).



The digital platform "BITBOX" – both in the phone application and on the web address [www.bitbox.lv](http://www.bitbox.lv) allows people to become lessee and lessors in a digitally secure environment and rent anything online. A person who wants to rent out his item, creates an account on the platform linked to the payment platform Stripe. Once Stripe is created, in the "BITBOX" platform you can add a new listing, fill in the necessary information, describe condition of the product, as well as add photos. Once the listing is created and published, all that remains is to wait for someone to choose to rent the property. If the lessor has chosen to reserve the item, the rental agreement must be signed first.

The platform was created to give people the opportunity to refuse unnecessary purchases, promoting a circular economy. It is an opportunity to extend the cycle of already purchased products, as well as a convenient opportunity to rent necessary things directly from their owners.

The platform would be a useful support for people in the following situations:

- if you need equipment for a specific event (photo camera, GoPro camera, etc.)
- if you need tools for repair, such as a drill for a do-it-yourself project or other instruments.
- if you need equipment for travel or other types of active recreation, such as a tent, sleeping net, etc.
- if you need entertainment equipment or paraphernalia, such as Xbox, PlayStation, Oculus VR glasses, etc. kind of equipment for a party
- if you need sports equipment, e.g., SUP board, roller skates, bicycle, etc. (especially if you are in another city and you want to enjoy sports activities, but you don't have your equipment with you)

### 3. Research methods

Most of this VET centres offer is educational. NA

### 4. Outputs and assessment

NA

### 5. Resources

Not enough time, lack of teachers.

There is a specific teacher responsible for students going to companies and doing apprenticeships, this is solely to oversee and mentor the students. Sometimes teachers who mentor students go to other countries (Erasmus programme) and network with other mentors and exchange experiences. Within the region, on a country basis – there is no established network for mentoring experience exchange.

### 6. Context and policies

In high school in 11<sup>th</sup> grade – term paper (30% practical aspect) – this is mandatory, and students do their own research (70% theoretical and 30% practical – this is usually based on data gathering). At VET centres – this is optional. Teachers do not advertise this too much in VET schools. If this would be integrated into curriculum modules, the teachers' approach would be different. Latvian teachers have a lot of freedom with regard to how the curriculum is taught. They are mandated to do research-based work.

## 7. Funding and revenue streams

NA

Ministry of Education and Science has funding options for research programme. From the interviewees perspective these funds are mainly meant for higher education institutes. The teachers at the VET school do not have time to look into potential funding options. The interviewee stated that there is a chance that funding options for VET schools may exist but she is not aware of them.

## 8. Engagement of SMEs and other stakeholders

Difficult to attract SMEs to work with VET schools.

The school would be very happy to collaborate more with SMES. First steps have been taken, below we can see the one very good cooperation with a company called draugiengroup.

<https://www.vtdt.lv/single-post/diskusija-ar-draugiem-group> A meeting to discuss the apprenticeship issues. During this meeting, the experience of "Draugiem Group" was discussed with VTDT teachers about students who had their apprenticeships in the company, what skills are expected from them. How to improve mutual cooperation, promote the quality of education. We discussed the role and importance of mentors in order for cooperation between companies and interns to be successful. More about the IT company I discussed about:

<https://draugiengroup.com/lv/sakumlapa>

There is a lot of work to be done to attract companies to collaborate with schools.

Main institutions that do applied research are on a higher educational level (higher than EQF 3 and 4).

## Interview results summary

### Organisation details

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Organisation name: MCAST Malta

Organisation website: [Mcast website](#)

### Interview results

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#### 1. Organisation structure and activities (include education level offered, e.g. EQF 3 to 6)

MCAST is a post-secondary vocational college. Accepting students from 16 years of age . Courses start from MQF (Maltese Qualification Framework) Introductory Level A (Introductory course level in Malta) to MQF/EQF Level 8 (Ph.D.). Operations have started in 2001. MCAST self-accrediting institution – accrediting own courses. MFHEA is the authority which monitors and gives such a licence. MCAST has about 7000 full-time students, 4000 part-time students, six institutes focusing on Applied sciences, ICT, Engineering and Transport, Business and Commerce, Community Services and Creative Arts—an additional campus on the island of Gozo. MCAST is Malta's leading Vocational applied institution, falling under the Ministry of Education.

Within the college are other departments such as the R&I department, services such as Wellbeing HUB, services and other departments like the Inclusive Education unit, a new library, resource centre, etc.

As a Vocational college, MCAST believes in a hands-on approach. Courses are not just theoretical. They also include work-based learning –exposure to the outside environment allows students to experience enhanced experience in the workplace.

Considering research and innovation –the College is actively collaborating with the industry. The core aim of MCAST considering research is to apply it, which could help Malta economically and improve everyday life.

#### 2. Value proposition

MCAST, through its **research framework**, offers various added value to multiple stakeholders.

Academics can engage in internal or external research (funded through MCAST) projects (Grants). The institution does not limit academics in areas academics want to be involved with. Although institutions still evaluate the proposal to align with the strategies. Such as Malta's strategy is based on six smart specialisation goals aligned with the SDGs. Additionally, there are thematic areas out of education (29 areas), i.e. digital health. Researchers are engaging with projects related to sustainable development – engaging in the projects where they see green objectives. The MCAST aims to Increase the number of projects they seek to engage with the industry.

Apart from projects, they aim to collaborate within the framework of alliances (CoVE and European University Alliance)

Infrastructure sharing – at the moment, MCAST doesn't have infrastructure-sharing policies – although the process of utilising this potential is being discussed – there is existing awareness of the need to create those collaborations based on infrastructure-sharing expert visits.

MCAST, as an institution, bases their approach on a flexible approach – a tailored approach for the labour market – It asks what the industry/company wants and sits together with it to create methodology together – the best methodology to be decided individually.

Example: Industry coming to MCAST with the willingness to have particular research done due to the need for improvement of a specific company aspect. The college assesses the opportunity and capacity to decide whether to take it. Another case is the request for designing training methodologies for companies that need employee training.

### 3. Research methods

All of the projects, training, and hackathons have entrepreneurship ideas embedded in the construction of the activities. The methodologies are being tailored to the needs of a research and the actors with whom the research is being carried out.

### 4. Outputs and assessment

On all MCAST courses, the institution supports Intrapreneurship at lower levels and entrepreneurship at higher levels of education. Especially for externally funded projects, the component of entrepreneurship is more involved.

### 5. Resources

Academic staff are working on terms and conditions based on the collective agreement – research was not very present in 2001 (at that time, MCAST didn't have level 6+ courses). It developed and built itself over the years, and most of the research is not covered by the collective agreement. Currently, the Institution does have a research framework – it is up to the academics to take up research and to show interest in requesting the research hours.

When a new project appears, an open call for the expression of interest is often launched. According to the expertise and applications, the researchers are being selected.

Incubation centre for the startups exists within the institution.

### 6. Context and Policies

Since MCAST was founded, society has considered the VET a *second-chance education system*. Gradually, the college managed to start changing the perception. This is visible, for example, through the perception of Industry mentioning that they prefer MCAST students considering their hands-on approach and education. Similar growth in reputation was observed from the society's perspective. The current strategy includes excellence, a very strong quality assurance system and trust building. In the newest strategy, MCAST aims to become a community college, build more synergies, and embed itself more within Maltese society.

Strong QA system, people feel safe that their courses are strong.

The country has no policy or strategy focusing particularly on Applied Research. Since MCAST is a vital institution in the field, they aim to impact the frameworks to enhance the applied paths opportunities in the country. institutions, push for the applied side of the grants, etc. Even in secondary schools, they incorporated the vocational route and applied route.

## 7. Funding and revenue streams

Funding opportunities regarding applied research are linked with the general funding framework for research. Therefore, the application is competitive.

Funding of the researchers' Ideas – whenever the lecturer approaches, there is an aim and usually a successful one, to find applicable funding opportunities on the national level.

The significant component in which MCAST is investing in is the research hours. Even with specific projects, they focus a lot on the capacity-building of the researchers.

## 8. Engagement of SMEs and other stakeholders

MCAST carries out several promotional activities, such as open days and EXPOs, to which everyone is invited to join.

Apart from the usual promotion, academics often come from industry – Academics are visiting the students doing work-based learning to meet and network even more. The factual relation is often maintained and established due to the Individual contacts. On the level of institutional management, bilateral cooperations and agreements are setting the cooperation boundaries and conditions.

Industry partners are being invited to the fora – where the context and needs of the industry and SMEs are shared. Additionally, senior research officers are employed to reach out to industry and look for research collaborations from which the industry and society could benefit.

The industry usually comes to MCAST for research requests if they see some value-added – usually, it would be a company and industry that is strong enough to invest in research – sometimes small entities do, but usually the stronger ones do. Usually, it happens when there is a need to back up the practical activities with academic knowledge and research and when there is a necessity to design training methodologies.

## Interview results summary

### Organisation details

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Organisation name: VET: Drenthe College

Organisation website: <https://www.drenthecollege.nl/practoraat-waterstof-in-de-industrie/>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

A practorate is an expertise platform within a vocational institution where practice-oriented research is carried out.

#### 2. Value proposition

Drenthe College focuses on hydrogen because it is an important energy carrier in the energy transition. Hydrogen will play an increasingly important role within industry. This, among other things, reduces CO<sub>2</sub> emissions by the industry. A practicum with this subject is unique in the Netherlands.

The hydrogen industry in Groningen and Drenthe, as an important successor to the natural gas industry, is transforming the region into Europe's first Hydrogen Valley. With an investment plan of over €10 billion until 2030, it includes 75-100 projects. Education and research, such as the 'Hydrogen in Industry' Practorate at Drenthe College, are crucial for the development of this sector. The growing hydrogen industry influences employment, sectors and required competencies. Skilled workers are needed to realize the energy transition and achieve climate goals.

See also [here](#).

Of the 17 hydrogen positions in high demand, 12 require an MBO background.

#### 3. Research methods

Many examples given are taking place: data gathering, desk research, data analysis, experiment, project, sampling, prototyping, hackathon (hack a problem), makaton (making), brainstorm, O&O project, feasibility study, etc. All in cooperation with the industry.

#### 4. Outputs and assessment

Results are mainly applied innovations usable for the industry. Also, information/knowledge.

Contribution to green transition.

#### 5. Resources

VET in cooperation with the industry. Good communication and shared interest need to be identified.

In NL large project, in which this takes place.

Practor Willem is also working in the industry himself, so he knows both sides (private and public).

The hydrogen industry in Groningen and Drenthe, as an important successor to the natural gas industry, is transforming the region into Europe's first Hydrogen Valley. With an investment plan of over €10 billion until 2030, it includes 75-100 projects. Education and research, such as the 'Hydrogen in Industry' Practorate at Drenthe College, are crucial for the development of this sector.

ALSO:

It promotes knowledge, skills, attitudes, and behaviours needed for specific tasks and activities, with an emphasis on practical skills in hydrogen technologies and processes. Teamwork, communication, creativity, and problem-solving skills are encouraged.

#### 6. Context and policies

The hydrogen industry in Groningen and Drenthe, as an important successor to the natural gas industry, is transforming the region into Europe's first Hydrogen Valley. Education and research, such as the 'Hydrogen in Industry' Practorate at Drenthe College, are crucial for the development of this sector.

#### 7. Funding and revenue streams

With an investment plan of over €10 billion until 2030, it includes 75-100 projects, including this practorate.

#### 8. Engagement of SMEs and other stakeholders

Active reach out to SMEs, they are part of the project, shared funding and businesses cofinance.

## Interview results summary

### Organisation details

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Organisation name: Foundation: Every VET a practorate (Ieder MBO een practoraat)

Organisation website: Practoraten.nl

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

Within higher applied education and universities, there has been done research about VET education (professional education) in the Netherlands, but until 2015 (more or less) the institutions for professional education themselves didn't do any significant research themselves yet. This led to a project in which doing research was required, and that in turn led to the more sustainable organisation of the foundation 'Every VET a practorate'. This foundation offers 'practical lecturers, so called practors, to guide students in VET education to do applied research while doing their internships at companies.

#### 2. Value proposition

VET practitioners want to make an active contribution to the innovative power of the sector. This means up-to-date vocational education and innovative potential among teachers and teams within the institution. A professional sector therefore needs research. Not to act important, but to make sensible, well-founded choices, to reflect, learn from others and keep our ears and eyes open.

A practitioner wants to provoke the typical functions attributed to research, within VET education.

Research takes place around a substantive domain that extends from innovation in the professional practice. It translates into an up-to-date and appropriate training for students in secondary vocational education institutions. It's all about the cross-pollination between research, training and professional practice.

#### 3. Research methods



Examples of activities in a practicum are: scheduling and programming of research, clarifying the question, looking at what is known (elsewhere) about the subject, analyzing of data, making knowledge, teachers and students applicable and workable bringing people into contact with professional practice and developing creative forms of knowledge circulation. The practitioner can do his own research, but that is not necessarily always the case.

All examples given are taking place within the practorates: data gathering, desk research, data analysis, experiment, project, sampling, prototyping, hackathon (hack a problem), makaton (making), brainstorm, O&O project, feasibility study, etc.

Important within the practorates is to *relate new research to already existing knowledge*.

About applied research:

Questions come from practice, but through question clarification an attempt is always made to better understand a question and to break it down into researchable parts.

- (innovation)Questions and challenges that are central to professional practice and can further help educational practice: in the connection between society and students and connected to the strategic agenda of the institution.
- It is not primarily focused on theory development but on applicable knowledge and solving practical issues: improvement and development of one's own practice are leading.
- An imitable approach that leads to useful and valid research results
- Participating or in co-creation with professional practice, for example by creating boundary practices that include vocational training and the professional field.
- Through substantive interfaces per domain in connection with professorships and science, with the confidence that practitioners will find their quality references in a broader world than that of secondary vocational education.

#### 4. Outputs and assessment

Results are mainly focussed on a strengthened curriculum and the professionalisation of teachers.

## 5. Resources

A practor is an official function, described in the job description, with allocated time (hours) and money (salary, and also funding for the activities, location, tools, etc.) This (function) is embedded within the organisation as a whole.

A PRACTOR:

- is a master of the profession (domain knowledge) and at the same time a teacher.
- acts from commitment to craftsmanship, curiosity and is able to create an environment in which craftsmanship for the future is formed.
- has an extensive network, knows the three worlds (research, education, and professional practice) well, can belong to those different worlds and is a connector par excellence.
- is good at knowledge management as a social process: can connect people and expertise.
- has status, is substantively authoritative (figurehead), serves as an example and is inspiring.
- is affiliated with a team and can be a 'free player': critical and independent.
- is sensitive/has an antenna for what is happening in the profession, what is going on with teachers and also for what students encounter during internships or after progression to higher professional education.
- looks over the hedge, has a vision of the future and looks at possibilities ('serendipity')
- is familiar with research (methods) and can give meaning to research data and make knowledge workable.

## 6. Context and policies

Till now, focus of funding for (applied) research was mainly on higher education. VET education was mostly left out of research funding.

Important is to keep the connection not only with education, but also with businesses. Positioning and reputation of VET needs to be improved but is not easy. However, if we want the results of applied research to reach businesses and society, we NEED to include AIR in VET. At first educational levels were seen as an escalator (higher education above, 'higher' than VET), now they are more seen side by side,

covering different areas of expertise, being more equal. However: scientists doubt quality of AIR in VET, so we need to pay attention to validity etc. (monitoring is done by funding organisations...).

#### 7. Funding and revenue streams

In 2023-2027, from 2024 onwards, funding will be available for VET education (MBO's), also in cooperation with existing funding like the RIF (regional investment fund, NL). So, there is some funding from the national and regional government, and the VET education institutions use their own money as well, but also businesses instigate AR, and public private partnerships are of mayor importance. Most money goes to personnel.

#### 8. Engagement of SMEs and other stakeholders

Cocreation: overlap between diverse methods of education and fluid transfers between education and businesses. **PPPs important:** businesses instigate AR, and public private partnerships are of mayor importance.

## Interview results summary

### Organisation details

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Organisation name: VET: Da Vinci College

Organisation website: davinci.nl

### Interview results

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1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

Da Vinci, an institution for VET education, is, in cooperation with the 'Duurzaamheidsfabriek' (sustainability factory, see other interview), and in cooperation with SMEs and other businesses (companies) in the region, doing applied and innovative research in various fields/sectors. Timon Jongkind is practor Smart Industries, including maritime make-industry, shipbuilders, dredging companies, all companies that make the machines needed on board of a ship, IT systems on board, etc. Students are ALWAYS involved.

2. Value proposition

Doing (project based) AR and having a practor employed and embedded within the institution, Da Vinci College connects to the objectives of the foundation 'ieder pmbo een practoraat' and aims to make an active contribution to the innovative power of the sector. This means up-to-date vocational education and innovative potential among teachers and teams within the institution. The practitioner wants to provoke the typical functions attributed to research, within VET education. Research takes place around a substantive domain that extends from innovation in the professional practice. It translates into an up-to-date and appropriate training for students in secondary vocational education institutions. It's all about the cross-pollination between research, training and professional practice.

3. Research methods

All examples given are taking place: data gathering, desk research, data analysis, experiment, project, sampling, prototyping, hackathon (hack a problem), makaton (making), brainstorm, O&O project, feasibility study, etc.

Important: making AIR visible.

Always include teachers involved in curriculum development from the start, otherwise changing and improving the curriculum, embedding new knowledge coming from AIR, is not very feasible.

#### 4. Outputs and assessment

Results are mainly focussed on a strengthened curriculum and the professionalisation of teachers.

Quality (of results) of AIR is not assessed, because it is focussed on a learning process, learning curve, failing is part of learning. However, involved private partners are often happy with the outcomes. Da

Vinci mainly focusses on delivering top skilled professionals: if they come from Da Vinci they are GOOD.

#### 5. Resources

A practor is an official function, described in the job description, with allocated time (hours) and money (salary, and also funding for the activities, location, tools, etc.) This (function) is embedded within the organisation as a whole.

Doing AIR in Da Vinci, the triple helix is involved:

businesses, companies, SMEs (all regional!)

education (Da Vinci and also some other VET schools and universities of applied sciences

Local government, also involved in funding, but is also potential 'client'.

Practors and other teachers involved are trained to take a coaching role, some know how to acquire clients and assignments for their students, but most important is their open attitude towards AIR.

Students are trained in teambuilding, project-based working, learning by doing – which is embedded within their curriculum.

#### 6. Context and policies

Again:

Triple helix of importance. Till now, focus of funding for (applied) research was mainly on higher education. VET education was mostly left out of research funding.

At first educational levels were seen as an escalator (higher education above, 'higher' than VET), now they are more seen side by side, covering different areas of expertise, being more equal.

Government still does not see the overlap and transfer between various fields of expertise: they still divide us into boxes like 'education' or 'innovation' or 'research', while in VET these overlaps.

Reputation VET needs to be improved. (Hence: delivering TOP skilled professionals is important.).

## 7. Funding and revenue streams

Various funding available, Duurzaamheidsfabriek (sustainability fabric) helps.

E.g.: from Ministry of Economic Affairs, Education funds within companies, regional funding for innovations, funding from the Ministry of Education, etc.

Most money goes to personnel: innovation management, project development, etc.

## 8. Engagement of SMEs and other stakeholders

Active reach out to SMEs, network, triple helix involved, indicate which PEOPLE are the frontrunners.

## Interview results summary

### Organisation details

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Organisation name:	De Duurzaamheidsfabriek (The Sustainability Factory)
Organisation website:	duurzaamheidsfabriek.nl

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

The 'Duurzaamheidsfabriek' (sustainability factory) is an initiative of the local government of Dordrecht and De Vinci College, an institution for VET education. It offers a 'neutral' space for VET institution and companies (triple helix also involved) to do AIR in various fields/sectors:

*Innovation is a matter of responding intelligently to opportunities and changing needs. You can see this in our projects. Sometimes we take the initiative, usually we help companies start up, manage and scale up their innovation projects. Do you want to start a project, participate in a project or are you looking for the right (education) partners or financing? Please do not hesitate to contact us!*

#### 2. Value proposition

The Sustainability Factory is a (physical) place where companies – from startups to global players – can take their innovations one step further. From innovation guidance to prototype construction or the first steps towards production. In our innovative factory and the associated production halls, various production and business spaces are available for rent and a large number of facilities are available – from water cutters to 3D printers and welding robots. The available education provides access to a broad spectrum of knowledge and students can be deployed in implementation where possible. The Sustainability Factory is part of a large innovation network, which allows it to effectively guide promising projects to financing, guide them through further development and scaling up, and make the right connections. The top, fourth floor of the Sustainability Factory is also equipped for consultations, meetings, training, and events. Arranged and coincidental meetings in the Sustainability Factory regularly led to innovative insights, projects, and products.

#### 3. Research methods

All examples given are taking place: data gathering, desk research, data analysis, experiment, project, sampling, prototyping, hackathon (hack a problem), makaton (making), brainstorm, O&O project, feasibility study, etc.

Important: *offer a physical space to invite businesses and VET education (teachers and students) to meet, insisting on an open view and attitude, without paying attention to short term projects or interests. Also: results need to be applicable! AND: part of Lifelong Development trajectories.*

The Duurzaamheidsfabriek also conducts an overall feasibility study about all their activities and partners.

The Duurzaamheidsfabriek also assists VET and companies which need funding. They connect. They work project based, are coordinating, do project management for the PPP's.

Key: just start, most things are possible, even if companies don't believe that at the start.

#### 4. Outputs and assessment

Results are mainly applied innovations. Also, information/knowledge.

Ideal: if the private partners are happy with the applied innovation, it is usable, and the students went through a learning curve, and the VET improved its curriculum, and maybe professionalised the teachers involved... This happens almost always :)

#### 5. Resources

Involve triple helix:

- businesses, companies, SMEs (now still regional) – offering them network, more power to innovate, ecosystem, shared tools or instruments, location, connection to funding a VET.
- education (Da Vinci College and some other VET schools and universities of applied sciences)
- Local government, also involved in funding and foundation of the Duurzaamheidsfabriek (50%) but is also potential 'client'.

Practors and other teachers involved are trained to take a coaching role, some know how to acquire clients and assignments for their students, but most important is their open attitude towards AIR.

Students are trained in teambuilding, project-based working, learning by doing – which is embedded within their curriculum.



## 6. Context and policies

Again:

Triple helix of importance.

Government still does not acknowledge the overlap and transfer between various fields of expertise: they still divide us into boxes like 'education' or 'innovation' or 'research', while in VET these overlaps.

Reputation VET needs to be improved. (Hence: delivering TOP skilled professionals is important.)

SME's instigate applied innovation.

Barrier: not all teachers can do this, it needs a certain mindset and open attitude.

Innovation managers needed, who are flexible, out of the box.

Cooperation with higher education and universities is there, but not always.

We need to improve the reputation of VET together.

## 7. Funding and revenue streams

Various funding available, Duurzaamheidsfabriek (sustainability fabric) helps.

E.g.: from Ministry of Economic Affairs, Education funds within companies, regional funding for innovations, funding from the Ministry of Education, etc.

Most money goes to personnel: innovation management, project development, etc. But upscaling from REGIONAL to NATIONAL also important now.

## 8. Engagement of SMEs and other stakeholders

Active reach out to SMEs, GOING TO THEM! offer network and ecosystem, triple helix involved, indicate which PEOPLE are the frontrunners. The physical space helps, is part of offering resources companies don't need to facilitate themselves.

Important: *offer a physical space to invite businesses and VET education (teachers and students) to meet, insisting on an open view and attitude, without paying attention to short term projects or interests. Also: results need to be applicable! AND: part of Lifelong Development trajectories.*

## Interview results summary

### Organisation details

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Organisation name: ROC van Amsterdam en Flevoland  
 Organisation website: [www.rocva.nl](http://www.rocva.nl)

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g., EQF 3 to 6)

The organisation is a VET Centre with a broad range of fields of education, such as technics, healthcare and fashion, that services a wide area around the city of Amsterdam and the province of Flevoland. Education ranges from EQF3 to 5, with the focus on 3 and 4, EQF 5 is small but increasing, also on the technical topics.

Besides education for youngsters that have finished their secondary education is there a lot of attention for further training and education, lateral entrants and how to reach and attract them, prevention of drop out, learning on the job for those who don't like education, and innovation of the education.

For the rest of the interview report is focused on the situation of interviewee, who is leading the Engineering, Technology, Mobility and Laboratory studies domain. The construction academy (who he is also the leader of) is one of the projects of this domain of the *ROC van Amsterdam en Flevoland* (in collaboration with other knowledge institutions such as Technical University of Delft, the UAS Hogeschool van Amsterdam and TNO (Netherlands Organisation for Applied Scientific Rese)

Besides all these activities more and more is worked on innovation in the fields of expertise. In most cases is worked in a collaborative way with other research organisations, HEIs, companies, housing organisations, governments, SEMs etc.

Building bridges between the knowledge needs of the real world and education is an important activity.

This VET Centre has also two practorates related to the sustainability of the built environment, one on installation and energy transition and one on building and building materials (circularity, biobased building). Both are focused on development of the education. The interviewee told also that most of the practorates are struggling with how to organise themselves.

#### 2. Value proposition

The research activities focus on solving problems related to do the things in practice, thus working on real life problems. This can be done by, for example, by:

- Building experimental models, such as a model of building façade wherein a Technical University can research the best way of sustainable renovation.

- Renovation of one or two dwellings in a neighbourhood to test the best way of renovation, which at the same time are places for the students to develop practical skills.
- Evaluation of the use of new materials for insulation (bio based) on humidity aspects.

Contract Applied Research for companies and SMEs is less common and only done on request. Most of the research activities are done in collaborative projects with HEIs, Universities, Knowledge Institutes, companies, training institutes and practical training centres, SMEs and sector organisations. The results of these projects are based on policies and integrated in the actual education programmes both regular and for continuous professional development. For the mobility sector there is a collaboration between this VET Centre and the companies in that sector, on learning, working and innovation combined. This collaboration is established as a organisation. A focus point in these collaborations is how to get the smaller SMEs involved in the new techniques, concepts and ways of working (such as digitalisation).

Another field of research focusses on the development of the own education and, for example, the process of attracting for, binding on and bringing them to the workplaces and organisations of the technical jobs. For the educational projects: The main results to be achieved are better education, with the newest topics and educational means (such as VR/AR) in it. In these cases, the VET Centre is also the customer of the research results.

In some innovation projects, the focus is not on the technology but on the social aspects, such as: how to work together, how the get every stakeholder involved. This also focusses on the impact of new concepts and technology on the way of working.

From the given examples in the interviewer guide are the most common activities working on applying knowledge towards a specific practical aim or objective (technical or social) and participating in (open) innovation ecosystems. This VET Centre does not offer equipment sharing. The needed equipment is available in practical training centres.

Value is developed for the society and (local government) to make the energy transition possible, with use of the available new and existing techniques, for the manufacturers, building and installation companies and for the own organisation to give the education needed for this.

### 3. Research methods

For the technical projects: Due to the collaborative way of working the used methods are focused on practical things, such as experiments, prototyping, building research models for HEIs and universities and so on.

### 4. Outputs and assessment

Assessment of results is done by other organisations such as the earlier mentioned TU Delft and TNO.

## 5. Resources

The needed knowledge for the research activities is for the technical projects mostly brought in by other parties such as universities and UAS.

The research activities are organised and done by the teachers (the specialist teachers) and the practors. In the research activities are the students involved. Preparation is based on learning by doing. The students don't get training on doing research. Sometimes in EQF5 training students learn to defend their choices.

Technical resources needed are the models, build or in the real-life situations (for example, the dwellings mentioned above).

As mentioned above, key partners are (practical) training centres, HEIs/UAS, universities, research institutes, companies, organizations.

## 6. Context and policies

In the Netherlands it is common for VET Centres to do their innovation activities in collaboration with others, building sometimes also their own collaborative organisations such as Centres of Excellence (CoE). The most used instruments are the Public Private Partnerships, funded by the government.

There is no policy that stimulates or obliges VET Centres to do innovation activities. This forms a barrier to do it. AR activities by VET Centres are done based on their own willingness to do it. For improvement of education are some grant schemes and policies.

VET Centres have their own place in the education system, between secondary schools and universities of Applied Science (EQF 6). EQF 5 is mostly done in collaboration between VET and UAS.

Important for the research done in the domain of the interviewee are the regulations on the energy and material transition. This is a huge enabler and opens the ways for funding and collaboration. For some grant requests they focus on the local policies the policies of the municipality of Amsterdam (e-mobility) and the province Flevoland.

A second barrier is that SMEs are not aware of the value of AR for their business, and it is not in the scope of them: they are focused on doing their job on time.

A general remark from DW: VET education has a negative label. EQF6 and EQF7 are far more valued (sometimes: overvalued).

## 7. Funding and revenue streams

Funding of innovation activities is based:

- Grants from the government, e.g., for the Public Private Partnerships, but also the Groeifonds (a development fund).

- Research activities can be done as part of the education programmes, which mean that the cost of students and teachers involved in the activities are covered by the education budgets.
- Payment for the research activities by the customer, such as a manufacturer or an building company. But this is a very small stream and has in the organisation of the interviewee no business model.

The funding was not heavily investigated during the interview. Of course, are funding and revenue important, but the focus was on the topics.

## 8. Engagement of SMEs and other stakeholders

For the interviewed VET Centre engagement is driven from the aim to apply to the solving of actual problems, such as labour market problems in the technical sectors, the energy and material transition in Amsterdam and so on.

The VET Centre is not active in attracting SMEs to asks their research questions to the VET Centre. Therefore, no information can be given on the channels used to reach them. For SMEs is this out of scope. Engaging SMEs requires a low-threshold approach. This means also that innovation should be offered to the point and practical for SMEs.

The VET Centre works together in different ways with a lot of stakeholders. In this collaboration is a focus on the own geographic area of the VET Centre.

The VET Centre organises knowledge sessions with compagnies, to share knowledge and to listen to their problems. When a question is more commonly asked, this can lead to a research question that will be solved in a master thesis of the TU Delft. Practical testing can then, when needed, done at the VET Centre. But the research itself is not done by the VET Centre.

Notes by DW:

Note 1: this organisation could not provide us with cases to study in T2.3. Maybe a focus on small VET Centres helps.

Note 2: answers are organised in the best possible way to the 8 topics but give sometimes also information about other topics.

## Interview results summary

### Organisation details

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Organisation name: SUMMA College  
 Organisation website: [www.summacollege.nl](http://www.summacollege.nl)

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)

SUMMA consists of 26 schools, each for a specific domain, e.g., health, safety, and business. Related to STEM, they have schools for laboratoria, ICT, Automotive, building, engineering, installation technics, and process technology.

In the STEM studies they focus on EQF 3 and 4, both full time studies and studies which are a combination of working and learning. Both type of studies leads to a full diploma

Interviewee is the leader of the school for electric and mechanical studies for the installation sector and practor for the practorate on sustainability and energy transition (related to different schools related to STEM studies). The practorate started in September 2022, after a starting period of about 2 years.

In the practorate and across the whole organisation is worked on explorative studies about the future and the impact on the way of education and the needed education. For the STEM studies this results in the integration of energy transition, climate adaptation and circularity in the curricula. Sustainability is also an organisation wide topic, together with value driven education and Lifelong Learning. Value driven education focusses on the students, based on a relation approach.

The practorate has two main goals: one is integrating sustainability in the curricula, in a way that students have a mindset on it and asks questions about it in both their work life and daily life. The other is the lifelong learning mindset related to the Human Capital Agenda of the Topsector Urban Energy.

Innovation at Summa College and in the practorate focusses on development of education and integration of new topics such as energy transition and climate adaptation and new ways of teaching (among others as a result of digitalisation) in the education, no innovation or applied and innovation research is done for others such as SMEs. The practorate is involved in some research projects, but this is also to implement the results in the education, to delivers as soon as possible students with the new knowledge to the labour market.

#### 2. Value proposition

The only direct customer of the innovation activities is SUMMA college. The indirect customers (but the don't pay for it) are the companies in the Eindhoven area (Brainport, but not only related to semiconductors or automotive) and the local, regional and national governments because the students

leave the SUMMA college fit for the future and for realising the goals of the policies made by the governments.

### 3. Research methods

Research methods for the development of education can be summarised as bringing in practice the theoretical didactical knowledge. Part of this way of working are experiment, development of models for the situation of SUMMA College, and projects.

Interviewer and interviewee discussed of the step to bring the knowledge in practice is also a way of development of new knowledge, and thus a Applied Innovation and Research activity. At the end both agreed on this.

### 4. Outputs and assessment

Assessment is done on an ad hoc basis, based on experiences.

### 5. Resources

Knowledge comes from educationalists, research on education and didactics, etc. To strengthen the knowledge of the staff, sometimes a educationalist (MSc) is enrolled in the organisation to give advice on how to implement the new topics and new ways of education in the curriculum.

The extra knowledge on education and didactics is needed, because a high proportion of the teachers are focused on their area of expertise, not on education knowledge.

The other needed resource is time.

### 6. Context and policies

An important fact is that in The Netherlands VET Centres for EQF 3 and 4 are not seen as knowledge institutes such as universities, HEIs and UAS or institutions as TNO. This means that they are not part of the innovation structure in The Netherlands and are not able to make use of the grant schemes that stimulates innovation and the use of innovation by among others SME and non-SME companies. [Note of DW: in my opinion is this a key insight about the situation in The Netherlands; maybe Katapult has more insights in this topic -> I've made a little document in the folder of T2.4: [Legislation about VET not being a knowledge institute.docx](#)]. There are also no other policies to stimulate AR by VET Centres.

In the long term plans for policy making is funding allocated to the practorates, but this is not implemented yet. Although, in the meanwhile is the practorates system emerging step by step, stimulated by their organisation Stichting Practoraten (foundation of practorates). Practocates focusses on development, at first for integration of new knowledge and innovations in education, related to both didactic and study content related topics. In some practorates there is also attention given to the

Applied and Innovation research related to the fields of education, with topics such as the use of climate data from satellites and hydrogen.

#### 7. Funding and revenue streams

With the development of the practorates have the VET Centres a funded way of working on the development of their educational activities. Other funding is found by being involved in research projects of Universities, UAS and the business sector (manufacturers and others).

With this funding teachers have time to work on development of the education and to focus on this topic. Without the practorates and the allocated money the urgent activities (teaching) prevail always above long-term activities, such as development of education.

Although there is some funding for the practorates, most of the funding for the innovation activities comes from the lump sum financing for the VET Centres for their education task on EQF 3 and 4 (the reason the exist).

#### 8. Engagement of SMEs and other stakeholders

Because SUMMA don't work on category 5 activities there are no activities to engage SMEs and other stakeholders for contract research.



## Interview results summary

### Organisation details

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Organisation name: ETAP Escola Profissional

Organisation website: <https://www.etap.pt/>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)

ETAP is a nonprofit private vocational school, which offers courses covering EQF 4 (secondary education by dual certification pathways or secondary education aimed at pursuing higher education plus professional internship). This is according to the Art. 6 and 7. Of the Decree – Law 4/98, of January 8, as well as the courses and training activities provided for in numbers 1 and 2, of article 10, of the same Decree – Law (<https://diariodarepublica.pt/dr/detalhe/decreto-lei/4-224851>). See the offer of professional courses <https://www.etap.pt/oferta-formativa/profissionais/>.

Moreover, ETAP has adult education through the Qualifica Centres that make the recognition of school and professional skills acquired by adults throughout life (LLL). ETAP also is a school with Erasmus accreditation, which means, that until 2027, they have funding allocated to send students abroad to carry out curricular internships and to invite specialists.

The education institution is also involved in Erasmus+ projects for students' mobility.

In the professional courses in addition to the formal teaching and learning activities, ETAP includes partnerships with companies, with the local community and within the framework of the pedagogical innovation model that they are implementing the TAZI model (original from the Basque Country). This means, that students found together with the community and the companies the real-life challenges to the classroom, so students have the chance to propose solutions to those. In the context of their traineeships, the students bring to schools the results of their internship, often incorporated in the professional aptitude tests they take in the last course year, cases or study or develop projects related to the internship activity they carried out in a company in the second year.

In addition to the companies, ETAP very much collaborates with local authorities, and with local associations in various areas.

#### 2. Value proposition

Internship opportunities, in which students work on reflection together, because of the combination of knowledge and experience, by having curious, reflective, committed, resilient, collaborative, autonomous, creative, communicative and active students who can bring creative and innovative solutions to the partners in the labour market context.

### 3. Research methods

Data collection and analysis, analysis and solutions for real-life cases that come from the business sector/companies and local authorities, for example (project). Linked with this, in the classroom, students brainstorm with their teachers on how to deal with problems that arise from the business community.

There is a lot of research for data while developing the students' autonomy: from first realizing what it is that they already know about a certain topic, then going in search of what they need to know to solve a problem to solve in a challenge, and how to find information, select and collect such information.

### 4. Outputs and assessment

The outputs of these relations can be materialised in various formats, including products, prototypes, and other solutions.

The ETAP qualitatively assesses the results of their teaching & learning activities. The assessment of the innovation activities led by the students is made in combination with the teaching & learning activities as it becomes part of their evaluation. The final student' assessment at the end of the course is assessed by a jury that evaluates the work done by each of the students. Another way of assessing these innovation activities is the evaluation of the performance of the students in the different modules included in the related activities. They also assess their activity plan and annual activity publishing a dedicated report.

ETAP does not detain intellectual property rights.

### 5. Resources

Human/technical: students; teachers and trainers, specialists (e.g. engineers)

Technical equipment – even though they must work “with what they have access to”

### 6. Context and Policies

ETAP activities are supervised by the Portuguese Ministry of Education. Their applications are approved by the National Agency for Qualification and Vocational Education for the Qualifica Centres (which is also supervised by the Ministry of Education).

Until 2005 in Portugal secondary education levels were reserved for professional schools (like ETAP), as before that, no other school had this kind of training offer. This has changed with a policy adopted by the national government to expand vocational education to public schools.

The main barriers to the development in the context of vocational education are insufficient funding for the needs of vocational schools (e.g. including the investment in technical equipment; and modernisation of the facilities), and the fact that the majority of the students (60%) choose a traditional path for their secondary studies (humanistic scientific courses) instead of dual certification and qualification offers (40%).

## 7. Funding and revenue streams

ETP overall activities are financed by 100% (85% of the funding comes from community funds and 15% comes from the state budget). This does not mean the applied research-related activities. Equipment and materials are the most expensive resources as well as other physical resources, which affect some areas rather than others (e.g. aircraft mechanics or automotive mechatronics). The payment for the service provided in partnership is not a reality, as ETAP is also a nonprofit institution, and they work 100% with funds with approved funds. What the partners offer, if applicable, are the materials to provide such services.

## 8. Engagement of SMEs and other stakeholders

This relationship with the ETAP's partners is led by the students.

A practical example of the Automotive Mechatronics Course is that they have a partnership established with a company and with the local firefighters. In this context, they keep the maintenance arrangements, repairs, etc., of everything possible to do within the ETAP maintenance facilities.

Another example is in the graphic design, in which in the scope of the professional aptitude tests, ETAP has developed the whole graphic line of the folkloric group of the farmers of Meadela de Viana do Castelo. Therefore, ETAP conceives the new graphic image and produces pamphlets, tarpaulins and decoration of vehicles.

Projects also developed in partnership with higher education institutions (Polytechnic Universities). Together with SMEs, students provide solutions and products, depending on the area of studies they are allocated, bringing their knowledge to improve these systems.

Even though the local level relationship with their local partners is more impactful, visible, and recurrent, ETAP has a long-term relationship with its partners beyond the local level, including other cities and abroad. Another partnership is with a Hospitality Group at the international level which also provides students the opportunity to go for their internships abroad.

An important factor is that the partnerships are related to ETAP curricula and training offers.

## Interview results summary

### Organisation details

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Organisation name: University Polytechnic of Setúbal

Organisation website: [www.ips.pt](http://www.ips.pt)

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)

Continuing education and micro-credentials and EQF 5 (CTeSP), 6, 7.

Teaching, applied research, projects to provide services (in various areas, especially engineering) to public or private organisations, and activities in the area of entrepreneurship (especially academic) through a business incubator for students to create a company or evaluate a business idea.

Some examples of projects in the area of energy are companies, in which professors and researchers work directly with companies and entities, for example, aspects related to energy certification for the development of new solutions, such as a project connected exactly to the energy that aims to increase efficiency.

Another project in informatics with the hospital of São Bernardo, in Setúbal, in which a professor evaluates, with resources to artificial intelligence techniques, images of mammograms for the faster or smarter detection of breast cancer.

In the scope of business sciences, several projects in the area, for example, of the circular economy, with the municipal councils, for example, with the municipal market of Setúbal to study the whole profile of sellers, and consumers of sustainability issues.

#### 2. Value proposition

The mission has an academic aspect, but it also has a research strand and contribution to regional and national development. Especially in the area of sustainability, and social responsibility, and there is also a dimension here that sometimes does not result in such obvious research outputs but added value for the Community.

#### 3. Research methods

There are 5 very distinct schools and scientific areas, as such, the methods also depend on the nature of the problem, and there is considerable diversity.

It depends on the scientific area, for example, in biotechnology more experimental methods are used in laboratories, rather than areas more linked to the areas of the social sciences and entrepreneurship in which the methods are based, essentially, on data collection and database analysis.

#### 4. Outputs and assessment

Outputs of a more scientific nature and that are also important, for example, publications of articles in journals recognized by international indexed peers, with patents, and intellectual property rights.

Intangible outputs, such as knowledge that is passed on and co-created with companies or organisations and that then result in efficiency gains in performance improvements.

Assessment: results are often evaluated by their peers, for example when publishing an article. If it is more in terms of the passage of this information to the market, it is often also for its operationalisation.

## 5. Resources

Human: in many projects, there is the involvement of students (research fellows) and teachers, a support team that does not do the research itself, but that supports everything that has to do with the financial management of the projects and support in the context of science management.

CTeSP students often do not have much maturity to develop applied research itself, but they develop, within the scope of the professional internship, a project with a small more theoretical part, with a literature review, but then it also focuses a lot on them realizing what is the contribution that they can give to the organization and what proposals for improvement they can bring to that organization (e.g. municipal councils). In this context, some organizations reported that they brought a breath of fresh air, especially through digital, where they brought some ideas and even innovative ways to implement some methodologies in the context of secretarial and accounting.

Equipment: areas of research that are very expensive, especially everything to do with technologies, engineering, and health. A partnership with the technician's laboratory in chemistry because to develop research in that area it is necessary to invest in equipment that is very expensive and that sometimes organization by itself does not have even financial capacity. Especially in the areas of technology and engineering, there is equipment or materials necessary to develop a certain type of research.

Time: time is an important factor here, and there should be an approximation with the schedule that universities have when it comes to research because there are professors who give 12 hours of classes.

## 6. Context and Policies

There is a great commitment to the issue of the employability of students and in this context, also of employability, being the second Polytechnic University in the country, with the highest employability rate at the national level.

Barriers to AR: availability of people in terms of time, so there should be a funding model that allows teachers more time to get closer to the university's reality. Other human resources, senior technicians, in the support services to the Financial Service, whether in support of research, or communication. Limitations in terms of hiring, of space, because one school is still inside the other, which causes limitations even of space to develop other laboratories and ideas or type of actions.

How the sector is perceived by society in general and stakeholders: some of the CTeSPs, for example, one with a partnership with a computer company, whose vacancies are exhausted and it would be necessary to offer 3 times more the number of vacancies to meet the demand, so there is a good perception, because students have a first contact with the institution, and most of the students continue to graduate, therefore, the vast majority.

A study was carried out on the economic impact of Polytechnic education with a very important contribution to the GDP for the economic development of these regions. Polytechnic universities bring a set of opportunities to students who would not otherwise study, due to geographical distance and associated costs, for example.

#### 7. Funding and revenue streams

Funding through projects of various types of natures of FCT projects, but also international projects funded by the European Union, Erasmus+. Also, some internal funding comes from the Institute itself (which is sometimes not as large as desired). Competitions of internal projects, funded exploratory or more developed, therefore, funded by the Institute and that has to have as a requirement, teachers of the various schools, and students involved. Finally, contacts with companies or external entities. Okay, we've also had this form of internal funding.

#### 8. Engagement of SMEs and other stakeholders

Hospitais, câmaras municipais, empresas, entre outros stakeholders, dependendo da area, mas cria-se valor para todos.

The science communication newsletters, they disseminate internally, but also to the Community, through the Office, also communication, as well as through the students (alumni). In the context of the student community, alumni, it is often the students who are already in the labour market and sought the IPS to develop projects.

IPS is developing a platform for organizations to pose problems that can be selected as part of a service delivery project or even be taken to the classroom to be discussed as a case as a student.

## Interview results summary

### Organisation details

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Organisation name: Research Fellow, Inst. for Adult Learning

Organisation website: <https://www.ial.edu.sg/>

### Interview results

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1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)

The company that Johnny worked for is a governmental policy making institute. Working for mostly for a TVET centres in a skills profile's issues.

2. Value proposition

Training for the workers, skill training, waste of time and money, initiating many ideas including skills in companies, also European companies' services, many of them small factories, focused training.

3. Research methods

Adoption of technology and skills for the workers  
Company > management and workers

4. Outputs and assessment

When the company is involved in the projects, the company is the one who make the assessment of the project, but there is not any tool specially for that.

5. Resources

The government pays to institute in Singapore almost everything. The applied research projects are almost totally paid for the government.

6. Context and policies

Equal system between public and private systems  
The projects on which are involved the SMEs, the project is paid in a 90% by the government and the 10% by the workers of the company.

#### 7. Funding and revenue streams

Enterprise Singapore & Spring are the ones who take part in the projects that are involved the SMEs and they try to make technological or skill profile projects with them.

#### 8. Engagement of SMEs and other stakeholders

The %80 of the population working in SMEs in Singapore. The SMEs are very little, with 1-9 employees, so they are very happy to be part of the government applied research projects and happy for being helped from the VET institutions.

#### 9. A case study example

Mostly the company of Johnny Sung works with VET centres involved in skill profile projects.



## Interview results summary

### Organisation details

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Organisation name: Šolski center Velenje

Organisation website: <https://www.scv.si/>

### Interview results

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#### 1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)

One of the largest vocational centre in Slovenia. It is in secondary education and consists of several vocational schools as well as high schools. It qualifies, or is considered, as an entrepreneurial educational establishment.

They have approximately 2,000 students. More than 35 vocational training programmes. Every day they welcome about 500 students in their workshops and didactic laboratories.

#### 2. Value proposition

Beyond initial training:

- Complementary training courses for workers, specialisation courses in the fields of machine tools, automotive, electronics, energy, computer engineering, ...
- Technological promotion activities (equipment, tools, machines...).
- They are not directly involved in research projects with the company. However, there are constant consultations, questions... to solve practical issues. For example, related to 3D design and printing they have had a request from a local museum to 3D scan and manufacture an original gun. They also receive requests from the municipality in which students are involved in its design and manufacture, with the tutoring and accompaniment of the teaching staff. However, it is mainly organisations and/or companies that ask for or make enquiries. It is not the schools that approach them proactively.
- There are also examples of collaboration with universities to share resources and knowledge in this context, but they are occasional.

#### 3. Research methods

Taking into account that this is not an activity in its own right, what is done on an occasional basis can be qualified as:

- Prototyping

And simply, a response to needs that arise, mainly using some physical resource of the school or through projects in which students are involved in a tutored way.

#### 4. Outputs and assessment

It is not measured.

#### 5. Resources

In government policy, its role is currently limited to education. And there is a clear distinction between secondary and tertiary education. Collaboration with business for applied research is circumscribed to universities and faculties. They are a "school" and are not allowed to work "commercially" with companies. There is no time available to develop this activity in a systematic or structured way.

About 10 years ago, there was some proposal to the government for this centre to have a new consideration along these lines, but it was not developed, and if it was, it was not envisaged to do it in a local bounded environment. After the pandemic, there are new moves to strengthen the relationship between education and business, but it is not really known how this will develop.

#### 6. Context and policies

- There are no policies along these lines.
- If the teaching staff is involved in any applied research action, it is because a specific project has been approved.

#### 7. Funding and revenue streams

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#### 8. Engagement of SMEs and other stakeholders

More support is needed from the Chambers of Crafts and Commerce. They represent enterprises and know their needs. At present the relationship with them is for student tests and examinations, but not for research and development. When their participation or help has been requested in the scope of a project, they have always been supportive, but this is not directly related to the promotion of this role.

Their systematic involvement would be needed, as SMEs find it difficult to devote resources to this type of initiative. SMEs are in production and day-to-day business, and it is difficult to formalise this type of relationship in this context. With larger companies it is easier, since they have resources or people for this type of initiative, or for the relationship with schools.

## Interview results summary

### Organisation details

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Organisation name: CIFP Armeria Eskola LHII

Organisation website: <https://www.armeriaeskola.eus/>

### Interview results

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1. Organisation structure and activities (include education level offered e.g. EQF 3 to 6)  
Public VET centre, over 75 teachers, 8 of them taking part in TKgune work team.

- a) Educational offer

EQF 4. 3 Middle grade vocational training cycles (Electrical and automatic installations, Machining, Electro-mechanical maintenance)

EQF 5. 6 High grade vocational training cycles (Industrial automation and robotics, Production programming in mechanical manufacturing, electronic maintenance, Administration of computer network systems, Design in mechanical manufacturing, Industrial mechatronics)

Vocational Education and Training Specialisation courses

EQF 5. 1 Specialisation course (Industrial maintenance digitalisation)

Courses for companies

- a. Customised courses for companies
- b. Courses for unemployed (*Lanbide*)
- c. Courses for professionals

Competence recognition for workers

- b) Innovation projects with companies (*Berrikuntza proiektuak*)

- a. Regional level innovation projects (*Sailburuordetzako proiektuak*) and MEC
- b. Services for companies to acquire new knowledge: TKgune programme projects (over six per year)
- c. For Education: Erasmus + KA2 European projects

2. Value proposition.

Further explanation of Innovation projects with companies (*Berrikuntza proiektuak*):

- a. Regional level innovation projects (*Sailburuordetzako proiektuak*) and MEC

- b. Services for companies to acquire new knowledge: TKgune programme projects (over six per year)
- c. For Education: Erasmus + KA2 European projects

They develop applied innovation projects with companies in the field of Industry 4.0 to respond to the SMEs demands. These projects requirements are to be innovative, done by teachers and financed by companies. The VET centres are no longer just employee providers; SMEs perceive them as applied innovation project providers being the easiest one to access comparing to universities or technology centres.

Another aspect that Basque VET centres work on, is the Competence Recognition for professionals that need to find out their level in the educational framework.

### 3. Research methods

Depending on the activities that the VET centre is working on, the research methods applied may vary. Some of them, such as, regional level innovative projects or educational projects, are more focused in the process of learning and as a result, they may reach just theoretical conclusions. By contrast, other activities with a different approach have to obtain a practical solution, as it happens in the TKgune programme. The methodology applied in the TKgune programme consist on four main steps:

- a) Identification of the applied innovative project chance in company. Usually there is a previous relationship between the VET centre and the SME, for instance, students that are in FCT (Training in Workplaces module).
- b) Definition of the applied innovative project by the group of teachers and proposal of budget to the company. Finding a solution to the need that the SME has explained to the teachers. It can be a prototype, data analysis, market research, industrialisation, automation etc.
- c) Development of the project by teachers. Having continuous iteration with the company and fulfilling quality requirements.
- d) Transfer of the knowledge acquired during the development of the project. See results in "Outputs and assessments".

### 4. Outputs and assessment

As mentioned before, depending on the activity that the VET centre is working on, both methods and results are different. On one side, in the case of regional level innovative projects or educational

projects, there is a special transfer day where teachers explain in a brief way the work they have carried out and a dossier is written in order to gather the knowledge developed.

On the other side, in the case of the results of the TKgune programme, ones that can be highlighted are:

a) Transfer to students:

- i. New challenges for Challenge Based Learning, from needs and problems that close companies have.
- ii. Didactic units created with activities and exercises that the real market is demanding.

Thanks to these; when they finish their studies, the alumni have a better understanding of the reality of the companies.

b) Transfer to companies:

- i. In many cases after the applied innovation project ends, companies ask for training for their employees.
- ii. Instruction manuals are also one of the most demanded results of these projects.

c) Transfer to teacher:

- i. The teaching staff from different Basque VET centres work in network in order to share the knowledge obtained in each project. These transfers can be done in seminars, courses or other formats.

During the interview, teachers also mentioned the personal satisfaction of the teaching staff working with new projects.

There is an evaluation of all the innovative projects that Basque VET centres develop. In some cases, as regional level innovative projects or educational projects there are expert groups that measure the fulfilment of the objectives that the project had.

In the case of TKgune projects, a satisfaction survey is sent to each company and later on, interviews are carried out.

## 5. Resources

In the case of CIFP Armeria Eskola LHII, most of the VET teachers that develop projects are related to mechanical manufacturing, industry 4.0 and additive manufacturing, but they also include electricians, robotics and electronics depending on the needs.

Apart from expert staff and knowledge, machines (machining centres, lathes, 3D printers...), proper workshops and laboratories (metrology, quality tests...), software (strength calculations, technical drawing, CAM...) and other equipment of the centre are used to respond to the needs that the projects require.

## 6. Context and policies

As the rest of the Basque VET centres participating in TKgune programme, CIFP Armeria Eskola LHII, fulfils the rules and laws that are applied in different levels, starting from the directions about applied research of the Vice-ministry of VET of the Education Department of the Basque Government, following with the Organic Law 3/2022, of March 31, on the organization and integration of Vocational Training of the Spanish Government and ending with the European Commission's education framework.

## 7. Funding and revenue streams

For companies service projects the funding comes from:

- SMEs own funding
- Eibar city council funding for innovation
- Personnel funding comes from the Basque Government

For Educational innovation projects Armeria Eskola has

- Public funding from different sources: Spanish Government (MEC), Basque Government (Education Dpt.), European Commission (Erasmus+).

On one side, in the case of regional level innovative projects, European projects or educational projects, usually are funded just by public funding from the Basque, Government, Spanish Government or the European Commission.

On the other side, in the opinion of CIFP Armeria Eskola LHII, in the context of TKgune projects, the costs that are paid by the companies are necessary to value the projects, other ways if it would be free; the companies would not think that the work done by the VET centre is valuable.

There are some public funds from the city council for the companies of Eibar help to foster the innovative projects, but usually most of the costs are assumed by the private investment of the company. Other public funds for TKgune programme may come from the Regional Council of Gipuzkoa or the Basque Government.

## 8. Engagement of SMEs and other stakeholders

When referring to educational based projects, it is not so easy to engage companies unless you offer something interesting for them. The involvement is higher when the scope is clear and the SME defines together with the VET centre the objectives and limits of the projects.

Apart from that, some TKgune projects have been carried out with research centres, even with the Basque Country University always together with SMEs. Several companies repeat with different projects, as they have had positive results in previous experiences.

This leads to closeness to companies, enrichment of the knowledge of the teaching staff and students, and improvement in the competitiveness of the SMEs.

## 8.2 Annex 2: Case Study Collection

COUNTRY	Organisation	Type of organisation	Name of initiative
Australia	Victorian TAFE		<a href="#">Examples of innovative projects run by TAFE VET providers</a>
Australia	Melbourne polytechnic Victorian TAFE	Polytechnic	Winemaking at Melbourne Polytechnic
Australia	Kangan Institute Victorian TAFE	VET provider	Kangan Institute's Textile and Fashion Hub
Australia	Homesglen, Victorian Tunelling Centre	VET centre	Tunneling Bolt case study
Canada	Camosun College	Community College	Camosun Innovates
Canada	Camosun College	Community College	COVID-19 Face Shields
Canada	Mohawk College	College of Applied Arts and Technology	Initiatives on: Additive Manufacturing Augmented & Virtual Reality Big Data Cybersecurity Biotechnology Unmanned & Remote Sensing Energy & Power Healthcare Industrial Internet of Things Social Innovation Sustainability
Canada	Mohawk College	College of Applied Arts and Technology	Ideaworks: AMIC
Canada	Mohawk College	College of Applied Arts and Technology	Ideaworks
Canada	Mohawk College	College of Applied Arts and Technology	Ideaworks
Canada	Mohawk College	College of Applied Arts and Technology	Ideaworks
Canada	Mohawk College	College of Applied Arts and Technology	Ideaworks
Canada	Mohawk College	College of Applied Arts and Technology	Ideaworks
Canada	New Brunswick Community College	Community College	Applied Research & Innovation (ARI) office
Canada	New Brunswick Community College	Community College	Beer-Flavoured Ice Cream
Canada	New Brunswick Community College	Community College	



Canada	Niagara College	VET centre / University of Applied Science/...	Niagara College's Research & Innovation division Horticultural & environmental sciences - mining company from British Columbia - Cuba Intellectual property - Zeolite fertilizer - collaboration with Havana
Croatia	Algebra UAS	University of applied science	AlgebraLAB
Estonia	Tartu Vocational College	VET centre	Chimney and stove/furnace manufacturing
Finland	Metropolia University of Applied Sciences	University of applied science	
Finland	Metropolia University of Applied Sciences	University of applied science	CLEMET - Cleantech Mobility Education for Tomorrow
Finland	HELSINGIN KAUPUNKI - City of Helsinki	Municipality	FAIR, European Digital Innovation Hub
Finland	HAMK, Finland	University of applied science	HAMK RD&I - COMPETITIVE SOLUTIONS
Finland	Business College Helsinki	UAS Centers of Vocational Excellence	DIHUB
Germany	URBAN ELECTRIC MOBILITY INITIATIVE (UEMI) GGMBH	NGO	GEMINI - Greening European Mobility through cascading innovation INITiatives
Italy	AzzeroCO2 SRL	Industry: Environmental Services	SKILLBILL
Malta	MCAST	University of applied science	MCAST Journal of Applied Research and Practice
Netherlands	3D Makers Zone	Public private partnership in VET	3D Makers Zone
Netherlands	OK/Nygaard	Company Centers of Vocational Excellence	BARCOVE
Netherlands	VET college Aventus/ University of Applied Science HAN	Public private partnership in VET	Cleantech Center
Netherlands	Ministry of Economic Affairs & VET providers	Public private partnership in VET	Digital workshop
Netherlands	Dutch Innovation Park/ Big Data Innovation Hub	Public private partnership in VET	Big Data Innovation Hub
Netherlands	Centre of Expertise Event Technology	Public private partnership	Hybrid learning environment Event technology
Netherlands	Yuverta	VET provider	Practorate Green Liveble Cities
Netherlands	Water Campus Leeuwarden	Public private partnership in VET & higher VET	Water Application Center
Netherlands	Koning Willem 1 College	VET centre	Het Talent Atelier
Spain	CIFP Bidasoa LHII	VET centre	Brine immersion timing machine for cheese production
Spain	CIFP Bidasoa LHII - CIFP Don Bosco LHII	VET centres	Threaded rod extraction machine
Spain	CIFP Armeria Eskola LHII		Intelligent manufacturing cell
Spain	Txorierra, CIFP Armeria Eskola LHII	VET centres	In-process measurement
Spain	CPIFP Oteitza LHIPI Oteitza Lizeo Politeknikoa	VET centres	Automatic deburring machine for automotive lampshades

Spain	CPIFP Oteitza LHIPI Oteitza Lizeo Politeknikoa	VET centres	Bread dough cutting die
Spain	CIFP IMH		MICRODECO Industry 4.0
Spain	IES CONDESTABLE ÁLVARO DE LUNA	VET centre	Composite repair cure control machine
Spain	CiFP Aguas Nuevas	VET centre	Design, construction and testing of four hydrogen cell powered prototypes
Spain	Centro San Valero	VET centre	Place for all
Spain	Centro San Valero	VET centre	404 Simulator
Spain	Centro San Valero	VET centre	Telemetric module for deafblind persons
Sweden	Curt Nicolin Gymnasiet	VET centre	Creation of a mould on a 3D printer for a metal tailstock
US	York Technical College	Community College	5-axis manufacture of hardened steel parts
Germany	Universität Bremen	University and Companies	MESA Media in Welding Education
Germany	Universität Bremen	University and Companies	Futurebox for veterinary assistants
Germany	Orange GmbH	Company	Dignet.Air
Germany	Zentraler Fachausschuss Medien	Association, University and Companies	Social augmented Learning

## CASE STUDY

Organisation	Homesglen, Victorian Tunnelling Centre
Type of organisation	VET centre
Region/County/Municipality	Australia
Name of initiative	Tunnelling Bolt case study
"Sector (Manufacturing, energy, healthcare, agriculture)"	Construction/Tunnelling
Short description of the initiative	Bolt prototyping and installation
Geographical scope	Australian and international clients
Public info:	<a href="https://holmesglen.edu.au/Industry/Victorian-Tunnelling-Centre/">https://holmesglen.edu.au/Industry/Victorian-Tunnelling-Centre/</a>

- Description of the initiative

Working with industry on bolt prototypes before full tunnel installation

- Development methodology:

Enquiry: communication with industry

Language: using the right terminology (not using the R word -> research)

Prototyping

Project Management

- Results

Research that goes on in the Tunnelling Center revolves mainly around prototyping.

Simulated tunnels are present, these are built above ground. The initiative is about collaboration with businesses and industry to test “things” before they go into the real-world environment.

A concrete rail tunnel was installed (big tube) and it was fit out with cable trays and floors.

The cable trays are installed using titanium bolts which hold the cable trays in place.

During the cable tray installation process in the rail tunnel, it was discovered that the titanium bolts were 1 cm too long.

2 cable trays held up by 4 bolts each, every meter for 18.2 km -> that means an enormous amount of bolts that would have been produced based on the wrong measurements. The industry adjusted their bolt production process based on the feedback.

Electromagnetic radiation testing was also conducted which tested potential interference under hospital buildings.

Industry stated that the overall research had saved them 12 million dollars.

## CASE STUDY

Organisation	Camosun Innovates
Type of organisation	Community College
Region/County/Municipality	Victoria
Name of initiative	COVID-19 Face Shields
"Sector (Manufacturing, energy, healthcare, agriculture)"	Healthcare
Short description of the initiative	When Island Health requested specialized personal protective equipment to protect front line staff against COVID-19 Camosun Innovates stepped up to design and manufacture over 9,000 medical-grade shields for local health care professionals.
Geographical scope	Victoria
Public info:	<a href="https://camosun.ca/innovates/spotlight/covid-19-face-shields">https://camosun.ca/innovates/spotlight/covid-19-face-shields</a>

## INDEX

- Initiative description

When Island Health requested specialized personal protective equipment to protect front line staff against COVID-19 Camosun Innovates stepped up to design and manufacture over 9,000 medical-grade shields for local health care professionals.

The Camosun Innovates team is led by Dr. Richard Gale, with Applied Research Technologist Matthew Zeleny serving as the coordinator of all COVID-19 response activities. As Canada began to prepare for the global pandemic, Zeleny reviewed the available open-source face shield designs and realized that a 3D printed solution would not be able to meet the growing demand. He consulted with Island Health and local manufacturer AP Plastics, then designed from scratch a new flat-pack version that Camosun's facilities at the [Babcock Canada Interaction Lab](#) could produce at a rate of 90 per hour rather than 10 per day using their industrial 3D printer.

- Images



Participants	Researchers
Funding	No information

More case studies from the organisation can be found on the website:

<https://camosun.ca/innovates/applied-research>

## CASE STUDY OVERVIEW MOHAWK COLLEGE

Organisation	Mohawk College
Type of organisation	College of Applied Arts and Technology
Region/County/Municipality	Ontario
Name of initiative	Ideaworks
"Sector (Manufacturing, energy, healthcare, agriculture)"	Additive Manufacturing Augmented & Virtual Reality Big Data Cybersecurity Biotechnology Unmanned & Remote Sensing Energy & Power Healthcare Industrial Internet of Things Social Innovation Sustainability
Short description of the initiative	<p>We work side-by-side with startups, established companies and community organizations to address their challenges firsthand, often accessing government grants and leveraging industry sponsored projects to make applied research opportunities possible.</p> <p>We enhance teams with specialized expertise from Mohawk faculty, staff and students.</p> <p>We provide access to specialized, industry leading equipment and one-of-a-kind comprehensive facilities.</p> <p>We help to de-risk new technology adoption through testing and trials.</p>
Geographical scope	Ontario
Public info:	<a href="https://www.mohawkcollege.ca/ideaworks">https://www.mohawkcollege.ca/ideaworks</a>

Links to concrete projects on Additive Manufacturing:

<https://www.mohawkcollege.ca/ideaworks/additive-manufacturing-innovation-centre-amic>

Links to concrete projects on Augmented & Virtual Reality:

<https://www.mohawkcollege.ca/ideaworks/creative-and-digital-solutions>

Links to concrete projects on Digital Transformation:

<https://www.mohawkcollege.ca/ideaworks/digital-transformation>

Links to concrete projects on Energy & Power:

<https://www.mohawkcollege.ca/ideaworks/energy-power-innovation-centre-epic>

Links to concrete projects on Healthcare:

<https://www.mohawkcollege.ca/ideaworks/medical-technologies-innovation-centre-mtic>

<https://www.mohawkcollege.ca/ideaworks/mhealth-ehealth-development-and-innovation-centre-medic>

Links to concrete projects on Sensor Systems and Internet of Things:

<https://www.mohawkcollege.ca/ideaworks/sensor-systems-and-internet-of-things-iot-lab>

## CASE STUDY

Organisation	New Brunswick Community College
Type of organisation	Community College
Region/County/Municipality	New Brunswick
Name of initiative	Applied Research & Innovation (ARI) office
"Sector (Manufacturing, energy, healthcare, agriculture)"	Mobile and Ubiquitous Computing Cybersecurity Educational Technologies Agri-food Health Information Technology Social Innovation Energy Efficiency / Clean Tech Marketing Advanced Manufacturing
Short description of the initiative	Using its unique expertise, equipment, and facilities, NBCC performs applied research to help solve technical and business problems. NBCC takes advantage of market opportunities and develops innovative technologies and processes that will enhance the way we live, work, and do business.
Geographical scope	New Brunswick province
Public info:	<a href="https://nbcc.ca/applied-research/research-projects">https://nbcc.ca/applied-research/research-projects</a>

More case studies from NEW BRUNSWICK:

<http://nbccstories.ca/we-can-do-that-history-meets-technology-in-applied-research-project/>

<https://nbcc.ca/applied-research/research-projects/nbcc-game-development-students-contribute-to-environmental-sustainability>

<https://nbcc.ca/applied-research/research-projects/promoscience>

<https://nbcc.ca/applied-research/research-projects/non-profit-data-collaboration>

<https://nbcc.ca/applied-research/research-projects/ece-and-trades>

<http://nbccstories.ca/marketing-students-tackle-real-world-research-project/>

<https://nbcc.ca/applied-research/research-projects/clean-up-arcade-game>

<https://nbcc.ca/applied-research/research-projects/technological-advances-in-additive-manufacturing>

## CASE STUDY

Organisation	New Brunswick Community College
Type of organisation	Community College



Region/County/Municipality	New Brunswick
Name of initiative	Beer-Flavoured Ice Cream
"Sector (Manufacturing, energy, healthcare, agriculture)" / Research Area	Agri-Food
Short description of the initiative/project	Pump House Group in Moncton wanted to explore food product development opportunities that would make use of their brewery wastes and beer products. A team of three NBCC Culinary Arts Management students led by Chef-Instructor Shawn Mathews assessed the feasibility of incorporating brewing by-products as flavourings for ice cream and other frozen desserts.
Geographical scope	New Brunswick province
Public info:	<a href="https://nbcc.ca/applied-research/research-projects/beer-flavoured-ice-cream">https://nbcc.ca/applied-research/research-projects/beer-flavoured-ice-cream</a>

- Initiative description:

#### The Challenge

Modern brewing operations produce a significant volume of waste by-products composed of grains, hops, and unrecoverable liquid leftover from the brewing process. The largest by-product of brewing is spent grains—wet grains leftover from the production of wort. This represents approximately 85% of the total by-product. In 2018, it was estimated that 38 million tons of spent grains were produced globally.

Pump House Group in Moncton wanted to explore food product development opportunities that would make use of their brewery wastes and beer products. Pump House Group's operations include beer production, spirits distilling, bottling, a brewpub, two restaurants, and a taproom. Their primary focus is beer production. Their beer is sold domestically, in the USA, and in Europe. They own several notable brands, including Pump House, Crafty Radler, and Venerdì Italian Seltzer.

#### The Solution

A team of three NBCC Culinary Arts Management students led by Chef-Instructor Shawn Mathews assessed the feasibility of incorporating brewing by-products as flavourings for ice cream and other frozen desserts. This team used classic culinary techniques to explore and refine recipes, serving formats, and brewery products in terms of both flavour and cost. Mathews was partially released from teaching and the students were hired as research assistants to work on this project outside of class time.

To support this project, NBCC Instructor Wendy Nason asked her second-year Business Administration: Marketing class to conduct market research as part of their coursework. The students conducted primary research by distributing samples of the ice cream products and collecting feedback from students and staff at the NBCC Moncton campus. The class also conducted secondary research, including a review of currently available beer-inspired ice cream flavours and an overview of the ice cream industry.

#### About the Collaboration

Pump House supplied the spent grains and beer flavours. Chef Shawn Mathews guided the students in the spent grain and ice cream processing and testing. The team developed some original ice cream recipes that leveraged brewery product and by-products to create original flavours. In total, three recipes were developed for three Pump House products (Muddy River Stout, Crafty Radler, Blueberry Ale) with several variations on the ingredients (chocolate, s'more, maple walnut, vegan, etc.) and format (pint, popsicle).

Marketing student research also produced several insights for Pump House, including identification of a preference for three products and preliminary indications of consumer preferences related to branding, price point, product format, and market segment.

This project was made possible thanks to funding from the Natural Sciences and Engineering Research Council of Canada (NSERC) Engage program.

- Methodology

This team used classic culinary techniques to explore and refine recipes, serving formats, and brewery products in terms of both flavour and cost.

To support this project, NBCC Instructor Wendy Nason asked her second-year Business Administration: Marketing class to conduct market research as part of their coursework. The students conducted primary research by distributing samples of the ice cream products and collecting feedback from students and staff at the NBCC Moncton campus. The class also conducted secondary research, including a review of currently available beer-inspired ice cream flavours and an overview of the ice cream industry.

- Results

- Achievements

In total, three recipes were developed for three Pump House products (Muddy River Stout, Crafty Radler, Blueberry Ale) with several variations on the ingredients (chocolate, s'more, maple walnut, vegan, etc.) and format (pint, popsicle).

- Results assessment

Quotes: “The applied research program—I think it’s a win-win in all aspects. Sometimes in the restaurant and food business and beer business, we don’t have enough time to do all the research ourselves. So why not bring NBCC in and students in with a different view on how they see our brands. So it’s great to see: rejuvenating our business, rejuvenating us.” - Kolin Barley, Owner, Pump House Brewery and Brewpub

“When we got to actually meet Pump House it made everything so real. They were talking about actually putting this product in Sobey’s one day. And it’s really crazy to think that something you put your hands on might actually end up like that.” - Destiny Walsh, NBCC Culinary Arts Management student

“I would definitely recommend this to any other students. It’s an amazing experience to be able to create a product and develop it.” - Jeremie Kerry, NBCC Culinary Arts Management student

- Transfer of knowledge

- Images



Participants	Faculty- and Student-led
Funding	Public, federal Canadian → Natural Sciences and Engineering Research Council of Canada (NSERC) Engage program

## CASE STUDY

Organisation	New Brunswick Community College
Type of organisation	Community College
Region/County/Municipality	New Brunswick
Name of initiative	Creating the Next Generation of Space Innovators with CubeSat
"Sector (Manufacturing, energy, healthcare, agriculture)"	Mobile & Ubiquitous Computing/ Digital Technologies
Short description of the initiative	CubeSat NB allows learners to participate in the design, build, and testing of New Brunswick's first cube satellite, named VIOLET after the provincial flower. NBCC students have used their senior technical projects to develop a UHF helical antenna and software-defined radio for the CubeSat NB ground station, as well as to revise and enhance one of VIOLET's printed circuit boards.
Geographical scope	New Brunswick province
Public info:	<a href="https://nbcc.ca/applied-research/research-projects/cubesat">https://nbcc.ca/applied-research/research-projects/cubesat</a>

- Initiative description:

### The Challenge

CubeSat Students. As technology continues to evolve at an incredible pace, careers in Science, Technology, Engineering and Mathematics (STEM) are in high demand. Experience and skills in these fields are critical to innovation and to forging a sustainable future. Having exposure to inspiring applied research projects helps drive student interest in STEM, which is why hands-on learning experiences in real-world scenarios often lead learners to discover their passion.

### The Solution

Students in the Electronics Engineering Technology program at NBCC have many opportunities to develop critical thinking, problem-solving, and collaboration skills through applied research and experiential learning projects. These range from experimenting with robotics and automation, to designing mobile apps and data communication systems, to aerospace engineering, and more. One such research project is CubeSat NB, which allows learners to participate in the design, build, and testing of New Brunswick's first cube satellite, named VIOLET after the provincial flower. VIOLET will help deliver new insights to scientists and researchers on the Earth's ionosphere. NBCC students have used their senior technical projects

to develop a UHF helical antenna and software-defined radio for the CubeSat NB ground station, as well as to revise and enhance one of VIOLET's printed circuit boards. Once built and tested, the satellite will be launched to – and then deployed from – the International Space Station in 2023.

#### About the Collaboration

CubeSat NB is a first-of-its-kind partnership among NBCC, the Université de Moncton, and the University of New Brunswick. The partnership is one of 15 groups nationwide to have the opportunity to work with the Canadian Space Agency on their CubeSat Project. This hands-on experience provides students with an opportunity to acquire a wide range of expertise and develop invaluable skills preparing them to become Canada's next generation of innovators— both in space and terrestrially.

- Methodology
  - Critical thinking, problem-solving, and collaboration skills.
  - Experimenting with robotics and automation, to designing mobile apps and data communication systems, to aerospace engineering.
- Results
  - Achievements
    - Develop a UHF helical antenna and software-defined radio for the CubeSat NB ground station, as well as to revise and enhance one of VIOLET's printed circuit boards. Once built and tested, the satellite will be launched to – and then deployed from – the International Space Station in 2023.
  - Results assessment
    - Quote: “From building satellites and antennas to robots and radios, NBCC students are exposed to many STEM fields and have the opportunity to learn by doing. It's the wide range of practical skills learned through experiential learning projects like this that give NBCC students a real advantage after graduation.” - Réjean Barriault, Instructor in NBCC's Electronics Engineering Technology program
  - Transfer of knowledge
- Images



Participants	Student- and Researcher-led
Funding	No information

## CASE STUDY OVERVIEW NIAGARA COLLEGE

Organisation	Niagara College
Type of organisation	VET centre / University of Applied Science/...
Region/County/Municipality	Ontario
Name of initiative	Niagara College's Research & Innovation division
"Sector (Manufacturing, energy, healthcare, agriculture)"	Business & Commercialization Food & Beverage Horticultural & Environmental Sciences Advanced Manufacturing
Short description of the initiative	Niagara College's Research & Innovation division provides real-world solutions for business, key industry sectors and the community through applied research and knowledge transfer activities.
Geographical scope	Ontario
Public info:	<a href="https://www.ncinnovation.ca/">https://www.ncinnovation.ca/</a>

Links to concrete projects on Business & Commercialization:

<https://www.ncinnovation.ca/business-commercialization-innovation-centre-projects>

Links to concrete projects on Food & Beverage:

<https://www.ncinnovation.ca/food-beverage-innovation-centre-projects>

Links to concrete projects on Horticultural & Environmental Sciences:

<https://www.ncinnovation.ca/horticultural-environmental-sciences-innovation-centre-projects>

Links to concrete projects on Advanced Manufacturing:

<https://www.ncinnovation.ca/walker-advanced-manufacturing-innovation-centre-projects>

### Case study example

- Initiative description
  - Horticultural & environmental sciences – mining company from British Columbia – Cuba Intellectual property – Zeolite fertilizer – collaboration with Havana
  - <https://greenhousetechnetwork.ca/success-stories/>

## CASE STUDY

Organisation	Algebra UAS
Type of organisation	University of Applied Sciences
Region/County/Municipality	Croatia, Zagreb
Name of initiative	AlgebraLAB
"Sector (Manufacturing, energy, healthcare, agriculture)"	
Short description of the initiative	Algebra LAB is a part of Pan-European network of Digital Innovation Hubs (DIHs). Digital innovation hubs (DIH) help ensure that every company, small or large, high-tech or not, can grasp the digital opportunities. With technical universities or research organizations at the core, DIHs act as one-stop-shops where companies – especially SMEs, startups and mid-caps— can get access to technology-testing, financing advice, market intelligence and networking opportunities.
Geographical scope	Finland, International
Public info:	<a href="https://www.algebra.hr/lab/en/contact/">https://www.algebra.hr/lab/en/contact/</a>

### Algebra Lab

Within the digital transformation issues, Algebra LAB is the place for organisations and individuals with a business problem, puzzle, idea or challenge who want to turn them into a business strategy, a financing plan or a monetisation proposal for a technology transfer.

Academic research is an additional element that strengthens our innovations in business and management. Furthermore, our technology business incubator serves as an inspiration and motivation for the public and private sector. At the same time, our innovative educational network is a vibrant meeting place for the businesses, with an open innovation to all who wants to work together addressing the challenges of the digital age.

Key services include:

- expertise,
- networks,
- training,
- consultation,
- development projects,
- student contacts
- multidisciplinary project-type learning projects.

Results

- Achievements
- Results assessment
- Transfer of knowledge



## CASE STUDY

Organisation	Tartu Vocational College
Type of organisation	VET centre
Region/County/Municipality	Estonia
Name of initiative	Chimney and stove/furnace manufacturing
"Sector (Manufacturing, energy, healthcare, agriculture)"	Manufacturing
Short description of the initiative	Testing process for manufactured stoves and chimneys to collect proof that the products comply with the EVS-EN standards
Geographical scope	Estonia
Public info:	Not available

- Initiative:

Initiative came from company Ahja Moodulahi – which wanted to reach a wider market with the manufactured stoves/furnaces. Two educational institutions were involved. Tartu university of Life science provided methodology and specific measuring equipment. Tartu Vocational College, namely teacher Mati Malm and heating systems construction students carried out the tests itself in VOCO's training laboratories. For that purpose, several stoves /furnaces and chimneys were built up for testing, measuring and documenting the results.

- Results:

Results were tested specifically for the company producing heating solutions (stoves and chimneys) from heat-resistant concrete and croval mass that will be assembled on construction sites. In cooperation with 2 educational institutions: Tartu Vocational College (VOCO) and Tartu University of Life Sciences the products were tested throughout the duration of about 2,5 years. The aim of those tests was to prepare approval documents for issuing eco-design labels for the products as well as prove compliance with EVS-EN standard in terms of flue gas emission rate, heat storage time and efficiency. VOCO carried out tests to test and measure compliance with the standards on the boiling as well as the thermophysical side of the furnace. The results were recorded. During the process teachers also tested

and documented different parameters during heating process like furnace's hearth, optimal firewood volume and combustion air vents to ensure that the stove works and complies with eco-design rules.

- Images



Training lab with the teacher – Mr. Mati Malm. Photographer: Mana Kaasik  
*(Please always list the name of the photographer: Mana Kaasik)*

Participants	Teachers	Students
Funding	Public	

## CASE STUDY

Organisation	Metropolia University of Applied Sciences
Type of organisation	UAS
Region/County/Municipality	Finland
Name of initiative	Big Flash
"Sector (Manufacturing, energy, healthcare, agriculture)"	Technological solutions
Short description of the initiative	<p>The Big-Flash project develops companies' competitiveness by promoting the adoption of emerging technologies.</p> <p>We helped, by organizing open training to everyone and offering companies opportunities to try out new technological solutions in practice. The new technologies are cobotics, autonomous robotics, IoT +5G and artificial intelligence and machine learning.</p> <p>The aim is to raise the competence of companies by offering experimentation and testing opportunities with student projects and by producing open online courses to introduce new technologies and facilitate related communication.</p> <p>In practice, companies bring a challenge related to the introduction of new technology, which can be solved as a student project. Students interreact and meet with companies' representatives trying to solve problems in teams.</p>
Geographical scope	Europe
Public info:	<a href="https://bigflash.metropolia.fi/">https://bigflash.metropolia.fi/</a> <a href="#">Big-Flash – sustainably towards competitiveness   Metropolia</a>

## CASE STUDY TEMPLATE

Organisation	Metropolia University of Applied Sciences
Type of organisation	UAS
Region/County/Municipality	Finland
Name of initiative	CLEMET - Cleantech Mobility Education for Tomorrow
"Sector (Manufacturing, energy, healthcare, agriculture)"	Automotive training
Short description of the initiative	<p>The Project focuses on tackling the increase of knowledge and know-how in the field of modern automotive technology and services. The project will create a learning platform and a roadmap to produce new, multidisciplinary learning packets for both people already in the working life but also for students still aiming to be a part of the industry.</p> <p>One of the key aspects of the project is to enhance and facilitate the use of common resources and find effective solutions for future education via common methods and mechanisms. CLEMET is a project coordinated by Metropolia University of Applied Sciences with Laurea, Omnia, VTT and the City of Espoo as participants.</p>
Geographical scope	Finland
Public info:	<a href="https://www.metropolia.fi/fi/tutkimus-kehitys-ja-innovaatiot/hankkeet/clemet-hanke">https://www.metropolia.fi/fi/tutkimus-kehitys-ja-innovaatiot/hankkeet/clemet-hanke</a>

## CASE STUDY

Organisation	HELSINGIN KAUPUNKI - City of Helsinki
Type of organisation	Municipality
Region/County/Municipality	Finland
Name of initiative	FAIR, European Digital Innovation Hub
"Sector (Manufacturing, energy, healthcare, agriculture)"	Artificial Intelligence & Decision support, High performance computing, Virtual Reality
Short description of the initiative	<p>The Project focuses on tackling the increase of knowledge and know-how in the field of modern automotive technology and services. The project will create a learning platform and a roadmap to produce new, multidisciplinary learning packets for both people already in the working life but also for students still aiming to be a part of the industry.</p> <p>One of the key aspects of the project is to enhance and facilitate the use of common resources and find effective solutions for future education via common methods and mechanisms. CLEMET is a project coordinated by Metropolia University of Applied Sciences with Laurea, Omnia, VTT and the City of Espoo as participants.</p>
Geographical scope	International
Public info:	<a href="https://www.fairedih.fi/en/frontpage/">https://www.fairedih.fi/en/frontpage/</a>

Funded by the European Commission, Business Finland and the Innovation Fund of the City of Helsinki, FAIR guides small and medium-sized companies in utilizing smart and digital solutions and developing their business free of charge.

## CASE STUDY

Organisation	HAMK, Finland
Type of organisation	University of Applied Sciences
Region/County/Municipality	Finland, Hame
Name of initiative	HAMK RD&I – COMPETITIVE SOLUTIONS
"Sector (Manufacturing, energy, healthcare, agriculture)"	Bioeconomy, Education, Digitalisation, Technology
Short description of the initiative	The HAMK RD&I – COMPETITIVE SOLUTIONS is divided into the 4 lots of sub areas.
Geographical scope	Finland, International
Public info:	<a href="https://www.hamk.fi/research/?lang=en">https://www.hamk.fi/research/?lang=en</a>

- The HAMK Bio Research Unit

The HAMK Bio research unit develops applicable and business-driven solutions in the fields of bioeconomy. In addition to strengthening the existing industry, we create new knowledge and innovations as well as commercialise and utilise new ideas.

The research is conducted in five diverse research environments, in which the ideas can be tested in practical conditions. Our strengths are practical competence in primary production, increasing value through processing raw materials, and utilizing side streams in the different phases of the value chain.

- The HAMK Edu Research Unit

The HAMK Edu Research Unit studies, supports, develops and transforms professional education, higher education, teacher education, work communities and organisations, to mention a few examples. The focus of our research and development work is currently in five different research areas: Vocational education and training, Career guidance, Future Work, Learn Well and Transforming Higher Education.

We are responsible for the RDI activities at the School of Professional Teacher Education, and we work in multi-disciplinary cooperation with other HAMK Schools and Research Units. We are strongly developing the export of education expertise and international research cooperation with HAMK Global.

Our unit is located at the Hämeenlinna University Centre at Visamäentie 35 A. See more detailed contact information here.

- The HAMK Tech Research Unit

HAMK Tech Research Unit is specialized in sustainable technology solutions. We focus on research and development within the field of metal and building industry, combining expertise in chemistry, mechanical engineering, construction engineering, electrical and automation engineering as well as energy technology.

At the society level we aim to promote the efficient and sustainable use of natural resources and increase the well-being of people by the possibilities presented by ecological technology solutions.

- The HAMK Smart Research Unit

The HAMK Smart Research Unit consists of specialists from several different fields with diverse and complementary expertise.

The goal of our research and development activities is to use data analytics and digitalisation in our selected focus areas. We conduct service activities for a fee on behalf of our customers and participate in both national and international research projects.

## Methodology

Key services include:

- expertise,
- networks,
- training,
- consultation,
- development projects,
- student contacts
- multidisciplinary project-type learning projects.

## CASE STUDY

Organisation	Business College Helsinki
Type of organisation	Center of Vocational Excellence
Region/County/Municipality	Finland
Name of initiative	DIHUB
"Sector (Manufacturing, energy, healthcare, agriculture)"	All, focussed on SMEs. Service focus on cloud computing, robotics, AI and Machine learning
Short description of the initiative	The DIHUB Centre of Vocational Excellence offers cloud-based services to SMEs in the skills ecosystems around the VET providers involved. In terms of innovation and applied research, the project connects VET students to SMEs to examine and optimize work processes for SMEs.
Geographical scope	Finland/ European
Public info:	<a href="https://www.dihub.cloud/">https://www.dihub.cloud/</a>

### ARE YOU FIT FOR THE DIGITAL AGE?

- DIHUB Platform – Cloud tech for people and businesses.
  - o Interested in boosting your business?
  - o Interested in building your skills and competencies?
  - o Interested in Cloud tech, AI and agile innovations?

Through the DIHUB platform, businesses can get in touch with VET providers and pose their question or challenge to the VET provider. The teachers at the VET provider will connect the SME/ challenge with the relevant students, specialized in cloud computing, robotics, AI and Machine learning. The students will work with their teachers and the companies to implement fitting solutions in the daily work of the SMEs, for instance using big data to optimize work processes, implementing digital services, etc. For examples of business cases and innovations done by students for SMEs, check out <https://www.dihub.cloud/> under business cases.



### Concrete project within DIHUB

Windfarm turbine optimization

- Methodology
- Achievements

Goal of the project was to optimize the turbines' performance by 8-10%, using the meteorological forecast and databases on weather of the last 10 years.

- Result assessment

The students and teachers involved in the project used a cloud based virtual machine processing all data to develop a model for each day of the year to optimize the turbines performance

- Transfer of knowledge

The results of the project were implemented in the wind farm and the results of the project are included in the educational program of the Helsinki Business School to add real life cases to the curriculum.



Participants	Teachers	Students
Funding	Public	

## CASE STUDY

Organisation	URBAN ELECTRIC MOBILITY INITIATIVE (UEMI) GGMBH
Type of organisation	NGO
Region/County/Municipality	Germany
Name of initiative	GEMINI - Greening European Mobility through cascading innovation INItiatives
"Sector (Manufacturing, energy, healthcare, agriculture)"	Energy, Mobility
Short description of the initiative	Gemini (Greening European Mobility through cascading innovation INItiatives) is a Horizon Europe project starting this year. It is to define, ideate, co-create, validate, amplify, and upscale five dimensions of innovation (Business, Social & Behavioural, Operational, Technology Enablers, and Governance & Policy Framework) for delivering safe, resilient, accessible, affordable, and sustainable shared mobility solutions and demonstrate them in four Mobility Living Labs (Amsterdam, Copenhagen, Munich, Turin) and four Twinning Cities (Helsinki, Paris, Porto, Ljubljana). The MLLs will stimulate improved access to public transport whilst introducing sustainable mobility business models in urban and peri-urban contexts, in turn leading changes in mobility patterns and behaviours, aimed at less car-centred urban mobility systems. Metropolia University of Applied Sciences is one of the 43 consortia partners.
Geographical scope	Europe
Public info:	<a href="https://www.geminiproject.eu/about/">https://www.geminiproject.eu/about/</a>

## CASE STUDY

Organisation	AzzeroCO2 SRL
Type of organisation	Industry: Environmental Services
Region/County/Municipality	Italy
Name of initiative	SKILLBILL
"Sector (Manufacturing, energy, healthcare, agriculture)"	Energy
Short description of the initiative	<p>Transition to a renewable energy system (RES) is both a societal and a technical challenge. Several barriers that hamper RES diffusion derive from educational and awareness gaps. Horizon Europe SkillBill (Skill to boost innovation and professional fulfilment in a sustainable economy) project offers knowledge and insight for the transition to renewable energy systems for businesses, public sector, citizens and students. The key project components include stakeholder community engagement, knowledge sharing and peer learning as well as skilling, upskilling and reskilling. Metropolia University of Applied Sciences (Finland), Utrecht University (Netherlands), University of Sevilla (Spain) and University of Tuscia (Italy) will develop a joint Specialization School (Sustainable energy and energy transition). The project also develops vocational education training. The project skilling, upskilling and reskilling efforts utilize innovative XR-based learning environments.</p>
Geographical scope	Europe
Public info:	<a href="https://skillbill-project.eu/">https://skillbill-project.eu/</a>

## CASE STUDY

Organisation	MCAST, Malta
Type of organisation	UAS
Region/County/Municipality	Malta
Name of initiative	MCAST Journal of Applied Research and Practice
"Sector (Manufacturing, energy, healthcare, agriculture)"	
Short description of the initiative	The aim of the MCAST Journal of Applied Research & Practice is to serve as a platform for showcasing vocational and applied research that is carried out either by researchers and professionals working within MCAST, or with one of its collaborative partners. The MCAST Journal of Applied Research and Practice is published on a biannual basis, with some 500 copies being distributed to lecturing staff, Malta's main libraries, as well as to MCAST main stakeholders.
Geographical scope	Europe, Malta
Public info:	

## CASE STUDY

Organisation	3D Makers Zone
Type of organisation	Public private partnership in VET
Region/County/Municipality	Netherlands
Name of initiative	3D makers zone
"Sector (Manufacturing, energy, healthcare, agriculture)"	Smart industry
Short description of the initiative	<p>MAKING.</p> <p>3DMZ (3D Makers Zone) is an innovative company specialising in industrial 3D printing with related complementary digital technologies. 3DMZ is situated in an old industrial garage shed that has been transformed into a creative, technological workspace where several labs have been set up with a range of large and small industrial 3D printers, robotic arms, 3D scanners and exhibition set-ups.</p>
Geographical scope	Netherlands, Amsterdam area
Public info:	<a href="https://www.3dmakerszone.com/index-eng.html">https://www.3dmakerszone.com/index-eng.html</a>

### MAKING.

3DMZ (3D Makers Zone) is an innovative company specialising in industrial 3D printing with related complementary digital technologies. 3DMZ is situated in an old industrial garage shed that has been transformed into a creative, technological workspace where several labs have been set up with a range of large and small industrial 3D printers, robotic arms, 3D scanners and exhibition set-ups.

### INNOVATION.

3DMZ is a unique place for accelerated innovation with organisations, companies, and educational and knowledge institutions. Ideas and concepts come directly to life here and are developed into prototypes, pilots, and end products. With our innovation programmes, experience is gained around business models that can be applied immediately. All the way from A to Z and everything in between.

### HAPPEN.

Through our live events, companies, organisations and educational institutions gain knowledge and network. Furthermore, 3DMZ also regularly hosts business events of external parties who want to organise something around innovation and digitisation. We also give inspiring tours of our own facility.

### R&Do labs.

Together with our partners and customers, we have set up several R&Do-labs. These R&Do-labs focus on specific industries and let large and small players in these sectors join forces to experiment and implement technologies such as 3D printing, Sensoring (Internet of Things) and Blockchain.

- Initiative

*Concrete case applied research and Innovation at 3D Makers Zone: BouwLab (Construction living lab)*  
 BouwLab R&Do is a unique place in the Amsterdam Metropolitan Region where (SME) companies from the construction sector can experiment, co-create and innovate with the latest technology. BouwLab helps the construction world towards a complete digital supply chain and drives the further industrialisation of the construction industry by using robots and digital manufacturing techniques, among other things. In addition, BouwLab is an experimentation place around circularity in construction. BouwLab R&Do is mainly about 'doing'. Because what the construction industry needs is a testing ground where it is easy to get started with innovative new technologies and concepts without rules.

- Methodology

- Achievements

Bouwlab offers different types of applied research projects: feasibility studies, prototyping, piloting and scaling up solutions

It offers a circular building, where SMEs can test their solutions for circular buildings, such as 3d printed bricks and reconstructable parts for a building

- Result assessment

The partners deconstructed a building that was about to be demolished and rebuild it in the Bouwlab. At this reconstructed building, the partners tested various solutions, such as a digital twin of the building, a 3D printer for concrete, circular interior modules, a digital construction process simulation to test the circular building process, 3d printed sculptures, 3D scanning and printing of sculptures, robotic masonry of a parametric wall.

<https://bouwlab.com/projecten-2/>

- Transfer of knowledge

The involved SMEs are using the knowledge generated in their daily practice in accelerating the circular transition in construction. New partners can use the BouwLab and the reconstructed building for further innovations and applied research.



Participants	Researchers	Teachers	Students
Funding	Public	Own funding	SMEs funding

## CASE STUDY

Organisation	BARCOVE – OK/Nygaard
Type of organisation	Centres of Vocational Excellence
Region/County/Municipality	Netherlands
Name of initiative	BARCOVE
"Sector (Manufacturing, energy, healthcare, agriculture)"	Urban Greening, creating cross overs between sectors. Climate change and climate adaptation
Short description of the initiative	The BARCOVE project, co-funded by the European Commission, aims to build applied research and innovation facilities into Centres of Vocational Excellence, by connecting startup companies that are not traditionally connected to the landscaping sector to more established companies in the sector and VET providers in the Blue Green sector. By doing applied research with the startups, VET students and teachers into the latest innovations, the latest solutions make their way into Urban Greening, such as smart green roofs, new forms of permeable pavements, innovations to SuD systems and using pressurized water systems without pumps.
Geographical scope	European
Public info:	<a href="https://www.linkedin.com/showcase/barcove/">https://www.linkedin.com/showcase/barcove/</a>

The steps BARCOVE is taking to build applied research into Centres of Vocational Excellence are the following:

- VET providers are being trained in applied research and innovation skills.
- Established companies in the Urban Greening sector, startups and VET providers identify challenges in their daily practice and for the near future to keep cities biodiverse, adaptable to climate change and liveable for all living creatures.
- Using the hackathon methodology, these stakeholders work on innovations from outside the urban greening sector to see how these can be applied in the sector.
- Per country, startups, companies and VET students and teachers are doing applied research into proof of concept of the solutions that came out of the hackathon.

Click here for the after movie of the first Bluegreen Innovation Challenge Hackathon.

[Aftermovie of BARCoVE's Blue-Green Innovation Challenge Hackathon 2023 in Aarhus, Denmark](#)





Example of a specific case:

- Initiative: What was the case?

Royal Ginkel Group is building and maintaining green roofs and vertical gardens in the Netherlands. In order to maintain these roofs and gardens, they need to keep track of a variety of indicators, such as water level in the crates on the roofs, evaporation of water, wind speeds, reflection, temperature and humidity of the soil, but also the level of biodiversity on the roofs by measuring the number of insects to prove that green roofs are indeed enhancing biodiversity.

- Methodology

- *Achievements*

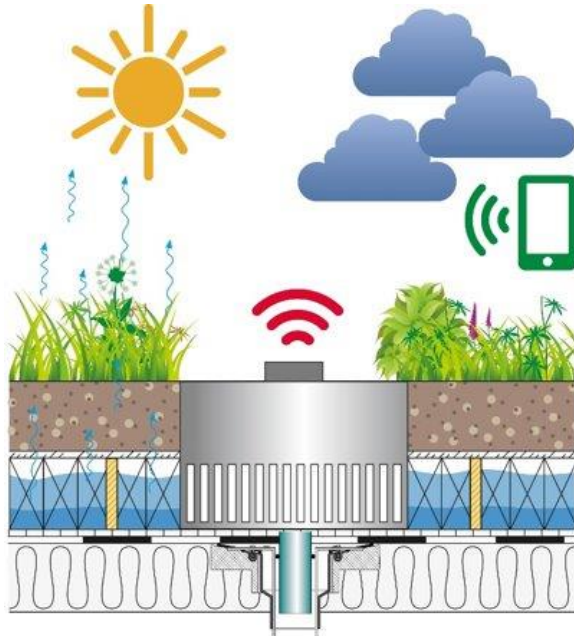
During the hackathon, the students worked with the companies on creating a smart dashboard to measure the abovementioned indicators with specific sensors, connecting this to a data platform in the cloud, which allows the workers of the company to monitor the roofs without having to go to the roofs, thus creating a smart green roof.

- *Result assessment*

The set up of the smart green roof will now be tested in a real life environment, by the students (guided by their teachers) and the companies.

- *Transfer of knowledge*

The companies are taking this set up to their own work processes and their customers, to implement the smart green roof in cities across Europe.



Participants	Teachers	Students	Company workers
Funding	Public	Own funding	SMEs funding

## CASE STUDY

Organisation	VET college Aventus/ University of Applied Science HAN
Type of organisation	Public private partnership in VET
Region/County/Municipality	Netherlands
Name of initiative	Cleantech Centre
"Sector (Manufacturing, energy, healthcare, agriculture)"	Focus on sustainability challenges for SMEs
Short description of the initiative	Never before has the need for new solutions in sustainability and energy been so great. Cleantech Centre takes the demand seriously and focuses on promoting sustainable practices and productions by organisations. It links companies with an issue in the field of sustainability to students in secondary and higher vocational education and secondary school pupils. In challenges, students tackle sustainability issues together with companies. More than 180 such challenges have already been held, providing knowledge and solutions for SMEs.
Geographical scope	Eastern part of the Netherlands
Public info:	<a href="https://www.wijzijncatapult.nl/oog-voor-iedere-aangesloten-mkber-cleantech-centre/">https://www.wijzijncatapult.nl/oog-voor-iedere-aangesloten-mkber-cleantech-centre/</a>

Cleantech Centre is a public-private partnership. What do you do, in brief?

"We bring entrepreneurs, education and government together and realise concrete business cases for application of clean and sustainable technologies. With the aim of less waste, less CO2 emissions, a contribution to a circular world and more jobs. Specifically in terms of the human capital agenda: we interest young people in technology and bind them to the Apeldoorn-Deventer-Zutphen region. We do this through competitions, challenges and organising knowledge sessions."

Why should I participate as an SME?

"Technically oriented SMEs, especially small businesses, have a challenge to find sufficiently skilled technical staff. Through us, you can find a solution to your sustainability problem and come into contact with students in secondary and higher education."

The Cleantech Centre ran from 2013 until 2021 and is now incorporated in the regular organisational structure of Aventus VET College, in the working group Cleantech Education.

- Initiative

Example of one of the activities: creating a circular abri/ bus stop

- Methodology

- Achievements

The production of busstops made of aluminium cost a lot of energy and have a high impact on the CO2 footprint, even when using recycled materials.

The students developed a biobased, modular and circular busstop, that fits in the streetview.

The roofs of the busstop are green, using sedum, which absorbs CO2 and enhances biodiversity and insect life in cities.

The busstop also includes sensors and 5G modules, to track traffic and measure other information in cities.

- Result assessment & transfer of knowledge

The producer of the busstops has taken the circular, modular and biobased busstop into production

[Circulaire, modulaire, biobased abri | HAN University of Applied Sciences](#)





Participants	Teachers	Students	
Funding	Public	Own funding	SMEs funding

## CASE STUDY

Organisation	Ministry of Economic Affairs & VET providers
Type of organisation	Public private partnership in VET
Region/County/Municipality	Netherlands
Name of initiative	Digital workshop
"Sector (Manufacturing, energy, healthcare, agriculture)"	All, focus on digitalization
Short description of the initiative	Digital Workshops have been set up by the Ministry of Economic Affairs & Climate, educational institutions, local authorities and businesses. As an SME entrepreneur, this is where VET students, teachers and experts provide you with customised help with digitisation. Think about online sales & marketing, data and automation; from getting your website in order to using data to better organise your business processes. That way, as an entrepreneur, you can increase your productivity and profits, or adapt your business to these difficult times.
Geographical scope	Netherlands
Public info:	<a href="https://www.wijzijkatapult.nl/digitale-werkplaatsen/">https://www.wijzijkatapult.nl/digitale-werkplaatsen/</a>

Digital Workshops have been set up by the Ministry of Economic Affairs & Climate, educational institutions, local authorities, and businesses. As an SME entrepreneur, this is where VET students, teachers and experts provide you with customised help with digitisation. Think about online sales & marketing, data, and automation; from getting your website in order to using data to better organise your business processes. That way, as an entrepreneur, you can increase your productivity and profits, or adapt your business to these difficult times.

<https://www.wijzijkatapult.nl/digitale-werkplaatsen/digitale-werkplaatsen-in-beeld/> à Dutch website with portraits, movies and podcasts on the impact of the Digital Workshops, for instance in the south of the Netherlands, where bakers can work more energy efficient due to the use of big data.

- Initiative

Concrete example of innovation in a Digital Workshop

An SME in the south of the Netherlands, an independent baker delivering bread in the south of the Netherlands struggled with his workprocesses administration to provide his 800 customers with deliveries

- Methodology
- Achievements

IT students analysed the workprocesses of the baker and digitalized his administration so he has to spend less time on administration and could better predict the orders using big data solutions. Based on the analysis and work of the students, an open source network of IT specialists developed an application to process all orders

- Result assessment

The baker is able to continue his business without having to hire additional personel (which saves costs, if he would be able to find someone anyway given the labor market shortages).

The baker can work more efficiently, spoiling less food, due to better predictions based on the data

Participants	Researchers	Teachers	Students
Funding	Public	SMEs funding	



## CASE STUDY

Organisation	Dutch Innovation Park/ Big Data Innovation Hub
Type of organisation	Public private partnership in VET
Region/County/Municipality	Netherlands
Name of initiative	Big Data Innovation Hub
"Sector (Manufacturing, energy, healthcare, agriculture)"	healthcare, smart living, logistics and smart manufacturing
Short description of the initiative	The Big Data Innovation Hub is the starting point for innovation, research and knowledge exchange around big data for companies, startups and (educational) institutions in Zuid-Holland. A key spearhead here is conducting applied research focused on current social and business issues around healthcare, smart living, logistics and smart manufacturing, among others.
Geographical scope	Province of South Holland
Public info:	<a href="https://dutchinnovationpark.nl/nl/">https://dutchinnovationpark.nl/nl/</a>

Source : <https://www.zoetermeer.nl/dutchinnovationpark>

Dutch Innovation Park connects and offers opportunities.

This is the Dutch Innovation Park: a strong ecosystem of IT start-ups, students and IT companies focused on applied innovation. Whether you work or study in the Dutch Innovation Factory, at the Dutch Tech Campus or at one of the other locations in the Dutch Innovation Park, we work towards the same goal: making people's lives safer, healthier, and more enjoyable through applied IT innovation.

The Dutch Innovation Park is therefore the hotspot in the Netherlands in the fields of e-health, cybersecurity, big data and smart mobility. Here, IT companies – from start-ups and scale-ups to medium-sized companies and multinationals, educational institutions, and research institutes – work together on innovative IT solutions and business opportunities.

Entrepreneurs, education, and research

The Dutch Innovation Park (external link) offers an excellent business climate, with an active community of IT professionals, some 800 hbo and mbo IT students and various research facilities including the Big Data Innovation Hub, Innovation Labs and lectorates.

Dutch Tech Campus

Renowned technology companies such as Siemens, Atos, Reconext and WS Audiology are based at the Dutch Tech Campus (DTC) (external link). At the DTC, companies in the field of smart technology, ICT and logistics are connected: current and new tenants can share knowledge and cooperate, creating an inspiring working environment with mutual synergetic effects.



### Dutch Innovation Factory

The Dutch Innovation Factory is the clubhouse of the IT community of Zoetermeer and the surrounding area. The building is home to over 25 different ICT companies and an internationally oriented tech investor. The Dutch Innovation Factory is the playground for digital innovators: under the motto we connect to create the business community and IT education work together on applied innovations in areas such as cybersecurity, smart mobility, eHealth and big data.

### Educational institutions and students

De Haagse Hogeschool is located in the Dutch Innovation Factory with its various HBO-ICT programmes: Information Security Management and Innovative Development. Third year MBO-4 IT students from mboRijnland also study in the same building. All companies in the Park have direct access to the IT students, teachers and lecturers. The universities of Leiden and Delft, with which the Dutch Innovation Park collaborates, are also easily accessible from Zoetermeer. In the Dutch Innovation Park, you are on top of IT talent!

### Dutch Innovation Community

The Dutch Innovation Community consists of IT companies located both inside and outside the Park. Members meet regularly and have direct access to the Cyber Security for SMEs lectureship, the Data Science lectureship, a start-up ecosystem and theme meetings. The Community also offers nice and good internships for education and a quick link to talent for business.

### Sharing knowledge

And the Park offers more ways to share knowledge and network. For instance, student assignments, internships and guest lectures are organised (in cooperation with De Haagse Hogeschool). The location is also home to the Big Data Innovation Hub, the starting point for innovation, research and knowledge exchange around big data for companies, start-ups and (educational) institutions in South Holland.

### Innovation labs

Whether it concerns better services or new solutions to social issues; technical innovation plays an increasingly significant role. That is why the Dutch Innovation Park offers plenty of space for entrepreneurs and education to experiment and innovate, for example in the InnovationLab, IoT-Lab, Human Behaviour Lab and SoftwareLab.

- **Initiative**

Concrete example of innovation at the Dutch Innovation Park: Digi workshop Haaglanden.

At the Digi workshop Haaglanden, VET students studying IT help SMEs creating an online presence.

- **Methodology**

- Achievements

SMEs that do not have the expertise to develop their online presence are being assisted by VET students to create an online presence (website, webshop, chat functionalities for customer service) for their company.

SMEs learn more about digitalization and how to implement this in their work processes.

- Result assessment

Greater efficiency in the workprocesses

Cost reduction

Increased customer satisfaction

Better decisions, based on data

- Transfer of knowledge

<https://youtu.be/ibF80GeBeok>

Participants	Teachers	Students	
Funding	Public	Own funding	SMEs funding

## CASE STUDY

Organisation	Centre of Expertise Event Technology
Type of organisation	Public private partnership in VET
Region/County/Municipality	Netherlands
Name of initiative	Hybrid learning environment Event technology
"Sector (Manufacturing, energy, healthcare, agriculture)"	Hospitality/ events
Short description of the initiative	<p>Three companies within the event industry are jointly establishing a Centre of Expertise Event Technology. Here, students, teachers, workers and companies can come together to learn. This takes place in a hybrid learning environment, where theory and practice come together.</p> <p>An important target group is MBO students. They go to work at Faber Audiovisuals. They put the knowledge they gain one day into practice the next. The combination of learning by doing reflection, theory and real-life actions ensures a great learning effect.</p> <p>The teaching material of the new Centre of Expertise takes shape in transferable modules. After completion of the project, those modules can be rolled out in other Centres of Expertise at three or four locations around the country.</p>
Geographical scope	National: Netherlands
Public info:	<a href="https://www.mkbideenetwerk.nl/project/hybride-leeromgeving-evenemententechnologie/">https://www.mkbideenetwerk.nl/project/hybride-leeromgeving-evenemententechnologie/</a>

## THE QUESTION

The events industry has evolved at a breakneck pace in recent years. Events are increasingly being transformed into 'experiences' with virtual and augmented reality, holograms, 3D projections and live streaming. This requires employees to change with it. Light, sound, images, IT: they have to be able to cope with everything. But knowledge and skills are rapidly becoming outdated, while existing education is often still geared to classic jobs, such as lighting or sound technician. There is therefore a great need for innovative forms of education. However, developing these is difficult for individual companies: the

events industry is a sector with many self-employed people and SMEs. On average, these have low budgets for training and development.

The Solution:

Three companies within the event industry are jointly establishing a Centre of Expertise Event Technology. Here, students, teachers, workers, and companies can come together to learn. This takes place in a hybrid learning environment, where theory and practice come together.

An important target group is VET students. They go to work at Faber Audiovisuals. They put the knowledge they gain one day into practice the next. The combination of learning by doing, reflection, theory and real-life actions ensures a great learning effect.

The teaching material of the new Centre of Expertise takes shape in transferable modules. After completion of the project, those modules can be rolled out in other Centres of Expertise at three or four locations around the country.

Participants	Researchers	Teachers	Students
Funding	Public	Own funding	SMEs funding

## CASE STUDY

Organisation	Yuverta
Type of organisation	VET provider
Region/County/Municipality	Netherlands
Name of initiative	Practorate Green Liveable Cities
"Sector (Manufacturing, energy, healthcare, agriculture)"	Urban Greening
Short description of the initiative	Climate change, increasing urbanisation and biodiversity decline call for a different design of urban areas. There will be more focus on green, blue, biodiversity and circularity. As a result, there is a different demand on the green labour market. The Practorate Green Liveable City responds to this changing green labour market and aims to prepare students, teachers and professionals for these developments. The unit consists of Heidi Kamerling and three teacher-researchers.
Geographical scope	Central part of the Netherlands
Public info:	<a href="https://www.groenehotspothouten.nl/leren/practoraat-groene-leefbare-stad">https://www.groenehotspothouten.nl/leren/practoraat-groene-leefbare-stad</a> and <a href="https://www.practoraten.nl/practoraten/groene-leefbare-stad/">https://www.practoraten.nl/practoraten/groene-leefbare-stad/</a>

In May 2021, the Practorate Green Liveable City was launched, led by practor Heidi Kamerling. The initiative for this VET professorship came from the network of higher education (lecturers, researchers) and the business community. Besides Heidi Kamerling, the department consists of three lecturer-researchers: Tom Lievens (Yuverta mbo Dordrecht), Jitske Noordermeer (Yuverta mbo Houten) and Simone Sauren (Yuverta mbo Heerlen). This practorate is embedded in the Green Hotspot Houten, a public private partnership in VET on landscaping and urban greening.

What is a practorate?

A Practorate is a knowledge platform consisting of a principal investigator (practitioner) and a research group in which VET students, VET teachers and specialists from the field work together to conduct practical research into innovation and improvements in VET education. The power of practical departments is to strengthen the connection between practice, research and education.

What does the practorate do and why?

In the coming years, our cities will take on a completely different face. To make them more climate-proof, urban planning will increasingly focus on green, blue, biodiversity and circularity. As a result, a different demand is arising in the green labour market. The Practorate Green Liveable City responds to this change and aims to prepare students, teachers and professionals for these developments by strengthening the connection between practice, research and education.

There are two main objectives within the Practorate:

1. To strengthen the connection between practice, research and education; to further bring scientific knowledge from the research organisations to the practice within which students, industry, civil society organisations and government bodies act. This allows building a learning community at regional, national and European level. The Practorate acts as a platform for research, expertise development in cooperation with the Green Hotspot Houten network.
2. Conducting applied practical research and experiments. The responsibility for the research lies with the practor, teachers and students. Collaboration with universities of applied sciences and higher education is possible, but research always goes hand in hand with business and/or social organisations.

<https://youtu.be/RWVTeGNjStE>

*Concrete example of Applied research/ Innovation:*

- Initiative: Testing of the Diopsis insect camera in practice. Methodology
- Achievements

The Diopsis Insect camera is developed by knowledge institute Naturalis. This instrument automatically takes pictures of insects, to measure biodiversity, and automatically sends the image to an online database. At the Green Hotspot of VET college Yuverta, the practor Heidi Kamerling is testing this instrument in practice, together with VET students and teachers, to see how the instrument works in practice and checking the results with manual biodiversity measurement methods.

- Result assessment

The results of the instrument are being checked by students, to see if the results are being determined correctly.

The project monitors the practical implications and constraints of the instrument, such as: how do you prevent the instrument being stolen, how to implement it without disturbing the environment

- Transfer of knowledge

The results of the applied research are being shared with the developer of the instrument, as well as with all landscaping companies connected to the Green Hotspot, so they can use it in their daily work.



<https://www.groenehotspothouten.nl/projecten/monitoring-vegetatie-en-insecten-houten>



## CASE STUDY

Organisation	Water Campus Leeuwarden
Type of organisation	Public private partnership in VET & higher VET
Region/County/Municipality	Netherlands
Name of initiative	Water Application Centre
"Sector (Manufacturing, energy, healthcare, agriculture)"	Water
Short description of the initiative	The Water Application Centre (WAC) is a fully equipped centre where companies, knowledge institutes and other organisations can carry out or commission experiments in the field of water technology. Located at the Water Campus in Leeuwarden, the WAC is the ideal partner when it comes to conducting research with water.
Geographical scope	Netherlands, but also international
Public info:	<a href="https://www.waterapplicatiecentrum.nl">https://www.waterapplicatiecentrum.nl</a>

The WAC's mission is to contribute to the development of a high-quality cluster in the field of water technology and the further completion of the Water Campus Leeuwarden as its physical crystallisation point.

Water is high on the economic agenda. Currently, there is a high demand for innovative technologies and products. For entrepreneurs in the Water sector, this offers plenty of opportunities within the knowledge-knowledge-cashier chain. To make this move in the water chain, (confidential) experiments are necessary.

To provide this, the initiative has been taken by Van Hall Larenstein and the Water Alliance. to establish the Water Application Centre at the Water Campus in Leeuwarden. The WAC facilitates the development of new technologies from laboratory table to pilot scale applications.

Facilities of the WAC for companies and other organisations that do not have their own facilities to conduct pilots or applied research.

Facilities of the ASC for students at universities of applied sciences and VET schools who can follow practical education in a real-life setting, conduct experiments and conduct research on the latest technologies together with the business community using test set-ups, pilots and practicals.



In short, the WAC facilitates education and industry in infrastructure and inventory for carrying out research!

- Initiative

*Concrete example of applied research at the Water Application Center*

The waterboard in Friesland (Northern part of the Netherlands), Wetterskip Fryslân, needs to control the quality of the water infrastructure, ecology under water and the water quality. The students of Firda (VET College) and Van Hall Larenstein (higher VET/ UAS) worked together using underwater drones to monitor these topics.

- Methodology

- *Achievements*

The VET students collected data in the field, using the underwater drone. The higher VET students analysed the results and translated these results into maintenance plans for the waterboard.

Based on the project, the involved partners are also testing different types of underwater drones to see which drones are suited best for which task.

- *Result assessment*

Because of this project, the waterboard can more easily monitor the status of the waterworks, and does not have to send divers into the water anymore for visual inspections. Furthermore, more detailed information is collected more easily.

Because of this project, students and experts from field from different specializations are now working together across boundaries that they did not do before

- *Transfer of knowledge*

The Wetterskip is using the underwater drones increasingly.

The applied research project is embedded in the curricula of both the VET schools and the UAS involved.

The information collected and analysis made by the students are used in the maintenance plans of the Waterboard.



Participants	Researchers	Teachers	Students	Company workers
Funding	Public	Own funding	SMEs funding	

## CASE STUDY

Organisation	Koning Willem 1 College
Type of organisation	VET centre
Region/County/Municipality	The Netherlands, Den Bosch
Name of initiative	Het Talent Atelier
"Sector (Manufacturing, energy, healthcare, agriculture)"	General and energy / SDGs
Short description of the initiative	The Talent Atelier (HTA) is an inspiring and dynamic place where our students from different MBO courses come together. In project groups, they work together on questions from real clients. The assignments are always linked to the SDGs.
Geographical scope	Region Den Bosch / Province of Noord Brabant
Public info:	<a href="https://www.kw1c.nl/">Het Talent Atelier   Koning Willem I College (kw1c.nl)</a> / <a href="#">Contact - KWIC Denkvaardigheid</a>

- Description of the initiative

The Talent Atelier is an inspiring and dynamic place where students from different schools of the Koning Willem 1 College (KW1C), each with their own discipline, come together. In project groups, they work together on questions from real clients. The assignments are always linked to the Sustainable Development Goals. These projects are carried out as part of EQF3&4 level courses and always in groups with students from different backgrounds.

The aim of The Talent Atelier is for students to gain experiences for the future so that they can innovate permanently and have a wide range of soft skills in addition to subject-skills. A key feature that encourages this is that the groups are formed randomly from the various schools and thus students often work and learn outside their comfort zone. Projects last on average ten weeks. The projects put practice a wide range of skills, such as research, analysis, creative thinking and presentation of the final solution. These can make use of all the modern techniques available at KW1C, such as 3D printers and VR.



zone.  
into  
final

- Development

The idea for The Talent Atelier was born to flesh out students' interdisciplinary work and encourage innovative ability and creative thinking. The World Economic Forum lists creative thinking as one of the five most important future skills. The founder of The Talent Atelier recognised this and therefore wanted to impart this very skill to the students.

The development took place within KWIC, mainly through a trial-and-error method, with The Talent Atelier starting small and growing bigger and bigger. No external parties were involved in the development, although there is sometimes support from external parties. The ICE model<sup>59</sup> was used during development.

The Talent Atelier was developed from KWIC's own resources. The further development is done with project funding and the prize they won in 2023. Carrying out the assignments from the region's businesses and governments and offering the result to them is done on the basis of good-will. Concrete results are sought so that these organisations get benefits from their efforts in creation assignments, but the focus of the projects is on the learning output for the students.

- Some remarks

A success factor was the support from the Executive Board, which had full confidence in the approach from the first moment. This was also reflected in a permanent place in the budget.

A challenge is the proper embedding in the educational structure, for instance in the valuation students receive for the execution of their project in The Talent Atelier. This now varies from school to school within KWIC.

A lesson learned is that taking on assignments has to be done carefully. Not every assignment lends itself to an interdisciplinary approach by students at EQF3&4 level.

An example project: the municipality of Den Bosch (KWIC's hometown) wanted a solution to get more fauna on the square near the school. For this purpose, the students developed a 5-metre-high tower consisting of four blocks, which has been placed at various locations in Den Bosch.

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<sup>59</sup> [ICE-Model - KWIC Denkwaardigheid](#)

The organisation of Het Talent Atelier has now been over by two other teachers, Tara Dielissen<sup>60</sup> and Verhoeven<sup>61</sup>. They focus entirely on The Talent apart from the subject area in which they originally In doing so, they pay a lot of attention to sharing Talent Atelier widely, so that it can be replicated in ROCs in the Netherlands.



taken  
Bert  
Atelier,  
taught.  
The  
all

Start with belief that something is needed.

- Awards

In June 2023, The Talent Atelier won the Dutch Education Premium of €1.2 million<sup>62</sup>. Every year, the Nationaal Regieorgaan Onderwijsonderzoek (NRO) awards this prize. The Talent Atelier won this prize because of the impact it makes and the close connection it establishes with the field. The money from the award will be used to further develop The Talent Atelier and disseminate the method.

*Pictures are copied with permission from the website of KWIC.*

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<sup>60</sup> [Tara Dielissen | LinkedIn](#)

<sup>61</sup> [Bert Verhoeven | LinkedIn](#)

<sup>62</sup> [Nederlandse Onderwijspremie 2023 uitgereikt aan teams in mbo, hbo en wo | NRO.](#)

## CASE STUDY

Organisation	CIFP BIDASOA
Type of organisation	VET centre
Region/County/Municipality	Spain/Gipuzkoa/Irun
Name of initiative	Brine immersion timing machine for cheese production
"Sector (Manufacturing, energy, healthcare, agriculture)"	food industry
Short description of the initiative	Process automation
Geographical scope	National
Public info:	

- Initiative description:

APAROLA GAZTAK, S.C. contacted TKgune to try to find a solution to the problem it had in the cheese production phase through the vocational training centres in the Basque Country.

- Methodology

This project has been carried out in the vocational training centre during a school year. This required the company's advice and the collaboration of an electrical teacher and a teacher of mechanical design and manufacture, as well as the use of different resources at the centre to carry out the design, development and assembly of the project. The teachers had to combine their classes and the development of the project in order to carry out this initiative.

- Results

- Achievements

- Thanks to this project, it has been possible to improve the cheese production process and reduce the inconvenience caused by the operators' trips to take the cheese out of the brine (after hours) and increase production. At the same time, the work has been coordinated with 2 different departments of the school, valid for collaborative learning.

- Results assessment

Once the project has been delivered and subsequently implemented, TKgune offers a feedback tool to evaluate the efficiency of the project, as well as to assess the degree of satisfaction of the company through a survey.

- Transfer of knowledge

The knowledge generated is shared among the teaching staff of the different departments that have developed the project in order to innovate the classes taught in the different specialities so that students can learn from real and current.

Project images:



Participants	Teachers	
Funding	SMEs funding	Public funding

## CASE STUDY

Organisation	CIFP BIDASOA (Don Bosco LHII collaborator)
Type of organisation	VET centre
Region/County/Municipality	Spain/Gipuzkoa/Irun
Name of initiative	Threaded rod extraction machine
"Sector (Manufacturing, energy, healthcare, agriculture)"	Manufacturing
Short description of the initiative	Process automation
Geographical scope	National/International
Public info:	<a href="https://tkgune.eus/eu/project/hagaxka-hariztatuak-ateratzeko-makina-prototipo-baten-diseinua-eta-fabrikazioa/">https://tkgune.eus/eu/project/hagaxka-hariztatuak-ateratzeko-makina-prototipo-baten-diseinua-eta-fabrikazioa/</a>

- Initiative description:

EGAÑA Caucho S.L. detected a cadence in the production process that was causing staff injured, so it contacted CIFP Bidasoa/Don Bosco LHII to try to correct this cadence by automating part of the production process using the TKgune tool.

- Methodology

This project has been carried out in the vocational training centre during a school year. This required the advice of the company and the collaboration of an electronics teacher, an electrician, a mechanical design teacher and a mechanical manufacturing teacher, as well as the use of different resources of the centre to carry out the design, development and assembly of the project. The teachers have had to combine their classes and the development of the project to be able to carry out the aforementioned initiative.

- Results
  - Achievements
  - Through this project it has been possible to improve the production process to reduce operator injuries and increase production. At the same time, the school's knowledge has been widened by innovating in the use of electronics applied to PLCs, considerably reducing the cost of the project.
  - Results assessment

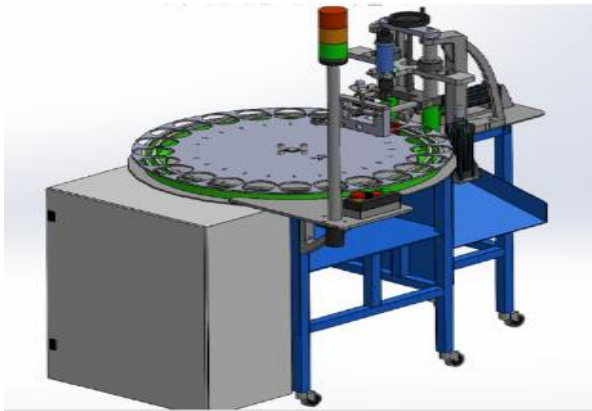


Once the project has been delivered and subsequently implemented, TKgune offers a feedback tool to evaluate the efficiency of the project, as well as to assess the degree of satisfaction of the company through a survey.

- Transfer of knowledge

The knowledge generated is shared among the teaching staff of the different departments that have developed the project in order to be able to innovate the classes taught in the different specialities.

- IMAGES:



Participants	Teachers	
Funding	SMEs funding	Public funding

## CASE STUDY

Organisation	Armeria Eskola
Type of organisation	VET centre / University of Applied Science/...
Region/County/Municipality	Eibar, Basque Country
Name of initiative	INTELLIGENT MANUFACTURING CELL
"Sector (Manufacturing, energy, healthcare, agriculture)"	Manufacturing
Short description of the initiative	VERIFICATION BY MEANS OF OPTICAL SYSTEMS AUTOMATIC COMPENSATION ON THE MACHINE TOOL ITSELF
Geographical scope	
Public info:	

- Initiative

This project is based on the communication and automatic compensation between 2 machines.

Specifically, between a CNC Lathe with Fanuc 32i control and a Vici Vision Machine. The measuring machine measures the part and automatically sends to the production machine the corrections to be made if the part is out of tolerance. Possibility of generating an intelligent cell, since the compensation between the measuring machine and the production machine is automatic.

Generating an intelligent Manufacturing Cell since there is communication and automatic compensation between 2 machines, with the purpose of producing "Zero Defects".

- Results

- Achievements

- Communication between production and measuring machines

- Communication for FANUC 32i control.

- Automatic compensation of dimensional errors automatically between measuring machine and production machine

- Compensation and communication between machines is possible, opening a very interesting and wide field to generate several possibilities (INTELLIGENT CELLS robotizing both machines, automatic process control with the aim of making "ZERO DEFECTS" key points in the context of industry 4.0.

- Results assessment

- Machine-to-machine communication achieved once the two machines have been parameterized.
- Automatic compensation performed, correcting the part errors automatically.
  - Transfer of knowledge
- Workshop held at the Armeria Eskola on 19/05/2023 (companies / centres)
- Training of the project to the group of the Metrology Specialization, of the Armeria Eskola.
- Dissemination:
  - Web SARIKI (full day video) ([https://www.youtube.com/watch?v=\\_YXXCWtKLqg](https://www.youtube.com/watch?v=_YXXCWtKLqg))
  - Web Armeria Eskola (<https://armeriaeskola.eus/es/jornada-tecnica-sobre-medicion-optica-a-pie-de-maquina-y-compensacion-automatica-en-torno-cnc/>)
  - MEWE "Advanced Manufacturing Node" (<https://mewe.com/group/5da5e429aff45e6d39c7cde8>)
  - Exposure of the project in different social networks:
    - LINKEDIN: [https://www.linkedin.com/posts/metrologia-sariki\\_revolucionaejn-compensaciaejn-automaertica-activity-7061611636310126592-ELQv?utm\\_source=share&utm\\_medium=member\\_desktop](https://www.linkedin.com/posts/metrologia-sariki_revolucionaejn-compensaciaejn-automaertica-activity-7061611636310126592-ELQv?utm_source=share&utm_medium=member_desktop)
    - INSTAGRAM: <https://www.instagram.com/p/CnWo9hWsjXy/?igshid=MzRIODBiNWFIZA==>
- Images



IMAGE1

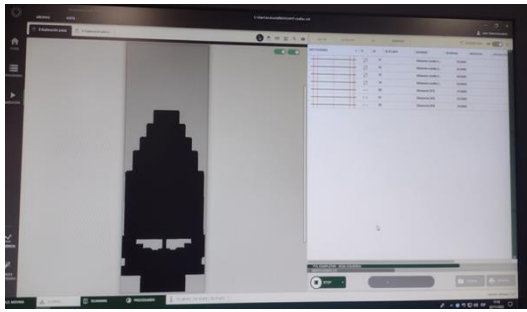


IMAGE2

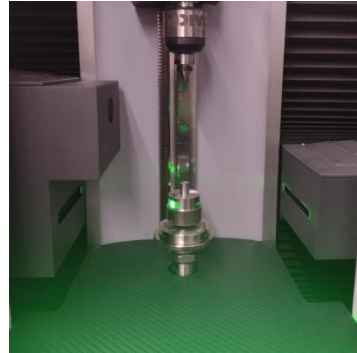


IMAGE3



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W 002	0.8957	0.0000	0.0000	3	Z	86.2336
W 003	0.0000	0.0000	0.0000	7		0.0000
W 004	0.0000	0.0000	0.0000	3		
W 005	0.0000	0.0000	0.0000	2		

IMAGE4

Participants	Teachers	
Funding	Public	SMEs funding

## CASE STUDY

Organisation	TXORIERRI,ARMERIA ESKOLA
Type of organisation	VET centre
Region/County/Municipality	Spain/Gipuzkoa/Eibar
Name of initiative	IN-PROCESS MEASUREMENT
"Sector (Manufacturing, energy, healthcare, agriculture)"	Manufacturing
Short description of the initiative	In-process measurement
Geographical scope	National/International
Public info:	<a href="https://tknika.eus/cont/proyecto-de-viceconsejeria/medicion-in-process-en-maquina-herramienta-cnc/">https://tknika.eus/cont/proyecto-de-viceconsejeria/medicion-in-process-en-maquina-herramienta-cnc/</a>

- Initiative description

This project is based on the integration of measurement systems in machine tools. The challenge consists of carrying out measurements in the process inside the machine tool that make it possible to obtain a valid component the first time, achieving zero defects. To achieve this, it will be necessary to work on the integration of measurement systems on the machine that allow the real geometries and exact positioning to be known during the machining processes and thus adapt the parameters of the programmes to adjust to the required tolerances.

The necessary equipment consists of a probe inserted in the MH itself, a Lagun milling machine with Heidenhain control. And a computer with 3D software connected to the M.H. In this case the software was the M3MH programme from the Innovalia group.

The milling machine can be used as a 3D machine, verifying any dimension and geometry without releasing the part.

- Methodology

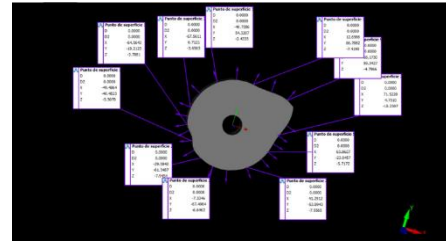
First of all it would be based on the Acquisition and Training in the necessary Equipment and Softwares on the part of the teaching staff. Solving communication problems between the PLC of the machine tool and the computer which controls the measurement software.

The next step would be to develop programs with different strategies for in-process measurement, performing various tests from CAD comparative measurement on the machine tool itself to importing the part reference system from the measurement system to the machine.

The last step would be the transfer to different training centers generating the relevant documentation for the correct development of the training.

- Results
- Achievements
  - Measurement with Renishaw OP40 probe on a machine tool with Fanuc control. Starting from a given thickness and - by correction of the tool offset - leaving it to measure, the stock to be removed is calculated by measuring the thickness by means of the probe.
  - By means of a probe and software (M3MH) integrated in the production machine with Heidenhain control, measurement against CAD and import of reference systems.
- Results assessment
  - Machining and verification of a cam, carrying out the CAD comparison on the machine itself without releasing the part.
  - Import of the part reference system to the Heidenhain control, in this case the contour of the cam.
  - Machining of the rest of the part using the part reference system.
  - APPLICATION: several cases initiated in the aeronautics sector but it can be applied in any sector that requires complex alignments without releasing the part and clamping it again to continue working without losing precision.
- Transfer of knowledge
  - Training of the project to the group of the Metrology Specialization, of the Armeria Eskola.
  - Dissemination of information on TKNIKA website:  
<https://tknika.eus/cont/proyecto-de-viceconsejeria/medicion-in-process-en-maquina-herramienta-cnc/>
  - Dissemination on the websites of the participating schools.

- Images



Participants	Researchers	Teachers	
Funding	Public	SMEs funding	

## CASE STUDY

Organisation	Oteitza Lizeo Politeknikoa
Type of organisation	VET centre
Region/County/Municipality	Spain - Basque Country - Zarautz
Name of initiative	Automatic deburring machine for automotive lampshades
"Sector (Manufacturing, energy, healthcare, agriculture)"	Manufacturing - Automation
Short description of the initiative	GKN driveline is a company which manufactures automotive metallic parts. They wanted to have automatic deburring machine for automotive lampshades. Oteitza Lizeo Politeknikoa manufactured this machine from the beginning until the end of the project
Geographical scope	The company sells his products all around the world
Public info:	<a href="https://tkgune.eus/project/diseno-y-fabricacion-de-una-maquina-de-rebabado-automatico-de-tulipas-de-automocion/">https://tkgune.eus/project/diseno-y-fabricacion-de-una-maquina-de-rebabado-automatico-de-tulipas-de-automocion/</a>

- Initiative

GKN driveline is a company which manufactures automotive metallic parts. They wanted to have an automatic deburring machine for automotive lampshades. Oteitza Lizeo Politeknikoa manufactured this machine from the beginning until the end of the project.

In order to manufacture the machine, a study of the technology being used in the company had to be carried out. To design a new machine that met the company's requirements (50-sheet specifications). Drawing up plans of the parts, electrical and pneumatic circuits of the machine. Mechanical manufacture of the machine, machining all the components of the new machine (all carried out at the Oteitza Lizeo Politeknikoa school). Automating the process with electric motors, gears, pinions, pneumatic cylinders, and their corresponding safety. Paint the whole machine according to the company's needs. Drawing up a document on how to use the machine.

### Methodology

- Results



- Achievements

Thanks to this project, it has been possible to automate the process of deburring automotive parts, improving the ergonomics and cleanliness of the worker when deburring the parts. In addition, the members of the project have learned to manufacture a fully automatic line and to collaborate between different departments of electricity, industrial automation and mechanics. In addition to learning to respect the specifications and safety standards that a machine to be introduced in an automotive company must comply with.

- Results assessment

Feedback from the company is the project's own assessment. The company had ordered a product together with its specifications and at the end of the project it was the specifications itself that carried out the verification of the project and its respective qualification.

- Transfer of knowledge

The knowledge generated is shared among the teaching staff of the different departments that have developed the project in order to be able to innovate the classes taught in the different specialities.

- Images



Participants	Teachers	
Funding	Public	SMEs funding

## CASE STUDY

Organisation	Oteitza Lizeo Politeknikoa
Type of organisation	VET centre
Region/County/Municipality	Spain - Basque Country - Zarautz
Name of initiative	Bread dough cutting die
"Sector (Manufacturing, energy, healthcare, agriculture)"	Food
Short description of the initiative	This project consists of scanning and machining an Ertacetal C roll on a 5-axis machining centre.
Geographical scope	The company sells his products all around Spain
Public info:	<a href="https://tkgune.eus/project/optimizacion-del-diseno-de-un-troquel-dentro-del-proceso-de-fabricacion-de-pan-mediante-ingenieria-inversa/">https://tkgune.eus/project/optimizacion-del-diseno-de-un-troquel-dentro-del-proceso-de-fabricacion-de-pan-mediante-ingenieria-inversa/</a>

### Initiative

The company Okin had a die that did not cut the dough for bread dough properly, so the automation line stopped every now and then because it detected that the dough had not been cut properly. In this project, the die used in the automation line was scanned using a 3D scanner. It was modified to make the cutting edge of the die thinner and based on this design, the Ertacetal C material blank was machined using 5-axis CAD/CAM technology and a 4-axis machining centre.

### Methodology

- Results
  - Achievements

Thanks to this project, the automation line has been able to function properly, and the cutting of the die is clean and safe.

On the part of the school, the teaching staff specialised in 4-axis machining and CAD/CAM design and it was a great challenge to scan and redesign the part for subsequent processing in CAD/CAM. Quite a challenge for the school.

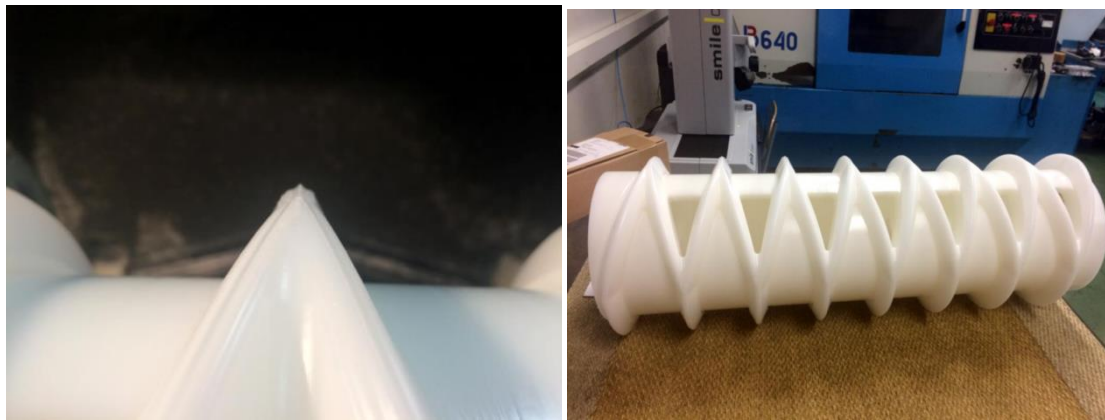
- Results assessment

Feedback from the company is the project's own assessment. The company had ordered a product together with its specifications and at the end of the project it was the specifications itself that carried out the verification of the project and its respective qualification.

- Transfer of knowledge

The knowledge generated is shared among the teaching staff of the different departments that have developed the project in order to be able to innovate the classes taught in the different specialities.

- Images



Participants	Teachers	
Funding	Public	SMEs funding

## CASE STUDY

Organisation	IES CONDESTABLE ÁLVARO DE LUNA
Type of organisation	VET centre
Region/County/Municipality	Spain - Toledo
Name of initiative	Composite repair cure control machine
"Sector (Manufacturing, energy, healthcare, agriculture)"	Manufacturing
Short description of the initiative	This machine is used for the repair of composite materials. In the manufacture of aircraft components, localised repair of small defects in the structure of the composite material is often necessary. It is also used for repairs on aircraft.
Geographical scope	The company sells his products all around the world
Public info:	<a href="https://www.iescondestable.es/index.php/actividades-y-proyectos/materiales-compuestos/300-presentacion-sicoteva-2008-cv-composites-20004">https://www.iescondestable.es/index.php/actividades-y-proyectos/materiales-compuestos/300-presentacion-sicoteva-2008-cv-composites-20004</a>

### Initiative

In the manufacture of aircraft components, localised repair of small defects in the structure of the composite material is often necessary. So this machine was created for the repair of composite materials.

The project and execution of this machine has been carried out by students and teachers from this centre and the Juan Antonio Castro Secondary School in Talavera de la Reina. These students are enrolled in the Higher-Level Training Cycles of Industrial Equipment Maintenance and Automatic Regulation and Control Systems.

### Methodology

- Results
  - Achievements

Thanks to this machine, the company is able to repair different composite material elements and to cure them. As for the school, it has been an important challenge for the teachers to be able to design and develop this machine with the characteristics and precision required and the students have been able to study by carrying out a real project required by the company.

- Results assessment

Feedback from the company is the project's own assessment. The company had ordered a product together with its specifications and at the end of the project it was the specifications itself that carried out the verification of the project and its respective qualification.

- Transfer of knowledge

The knowledge generated is shared among the teaching staff of the different departments that have developed the project in order to be able to innovate the classes taught in the different specialities. In addition, the students have been able to study with a project that required a lot of precision and seriousness and have been able to know what it is like to be involved in a project of this nature.

- Images



Participants	Teachers	
Funding	Public	SMEs funding

## CASE STUDY TEMPLATE

Organisation	AGUAS NUEVAS CIFP
Type of organisation	VET centre (Centro Integrado)
Region/County/Municipality	SPAIN (Albacete)
Name of initiative	Design, construction and testing of four hydrogen cell powered prototypes.
"Sector (Manufacturing, energy, healthcare, agriculture)"	Aeronautical industry
Short description of the initiative	Design, construction and testing of four hydrogen cell powered prototypes
Geographical scope	
Public info:	<a href="http://www.cifpaguasnuevas.es/noticias/361-notadeprensa2022">http://www.cifpaguasnuevas.es/noticias/361-notadeprensa2022</a>

- **Initiative description**

### Participants

The INSILLA Institute of Prat de Llobregart (Barcelona) and 3 Spanish companies are participating with the CIFP Aguas Nuevas. They are:

- Omicron Engineering, which carries out the design and theoretical training of the students.
- Technological Business Integration which will carry out the practical training of the students as well as support the construction of the prototypes.
- FRP Advanced Technologies, which manages the import of hydrogen cells and supports their integration into UAVs.

### Funding

- It is funded by the MEF, according to the 2021 call for Innovation Projects in VET, which uses European Funds from the Transformation and Resilience Plan. The amount allocated to the project was €160,000.

### TECHNICAL CHARACTERISTICS OF THE UAV

- Dimensions and weight:
  - Wingspan : 4.5 m
  - Length: 2m
  - Fuselage: 2m

- Middle rope : 45 cm
- Unladen weight: 20 kg
- Maximum take-off weight: 25 kg.
- **Methodology**
  - The students have received two theoretical and practical training courses, given by the participating companies, entitled "Design and construction of fixed-wing UAVs" and "Operation and maintenance of fixed-wing UAVs" of 25 hours each. In these courses, the students, in groups of 4, have built and flown a 2 m wingspan UAV equipped with cameras and Autopilot based on the Pixhawk board.
  - Once the courses have been completed, the students carry out the construction of the project's UAVs, led by the Project Director and a technician from the company-partner. They use the materials and plans supplied by the companies.
  - When the UAVs are ready for flight, the flight has been carried out by the instructors, with the support of the students for assembly and preparation for flight.
- **Results**
  - Achievements
    - DESIGN, BUILD AND FLY THE FIRST HYDROGEN FUEL CELL POWERED UAV IN SPAIN
    - TRAIN SOME 40 STUDENTS IN FIXED-WING AIRCRAFT DESIGN, CONSTRUCTION AND OPERATION TECHNIQUES.
    - ESTABLISH A WORKING RELATIONSHIP AND PARTNERSHIP BETWEEN THE TEAMS OF TEACHERS AND STUDENTS PARTICIPATING IN THE TWO VET SCHOOLS.
    - ACHIEVE AN EXPERIMENTAL UAV MODEL THAT CAN SERVE AS A BASIS FOR A COMMERCIAL DEVELOPMENT WITH 5 KG PAYLOAD AND 2 H OF AUTONOMY WITHOUT POLLUTING EMISSIONS AND LOW NOISE LEVEL THAT CAN BE COMPETITIVE WITH DEVELOPMENTS OUTSIDE SPAIN.

- DISSEMINATE THROUGH DIGITAL AND AUDIOVISUAL MEDIA THE ABOVE POINTS, WHICH HAS HIGHLIGHTED THE VOCATIONAL TRAINING, THE CIFP AGUAS NUEVAS AND THE INSILLA INSTITUTE OF EL PRAT DE LLOBREGART.
- Results assessment
  - Flight test results:
    - As part of the project, 4 prototypes have been built and all of them have been tested on the ground and in flight.
    - Since 1 December 2022, the fully equipped H2 cell and a cylinder charged to 250 bar have been available and the first flight was made with it on 10 December 2022, with a duration of 15 min.
    - Subsequently, several more flights have been made with a maximum duration of 60 minutes.
  - Transfer of knowledge
    - Images

PRESS RELEASE: <http://www.cifpaguasnuevas.es/noticias/361-notadeprensa2022>

VIDEO OF THE FLIGHT OF THE FIRST UAV-H:

<https://drive.google.com/file/d/1r3pECWIFBFN6fmK7m70pAV0Gw8uug74v/view>

Participants	Teachers X	Students X
Funding	Public X	
	MEFP, according to the 2021 call for Innovation Projects in VET	

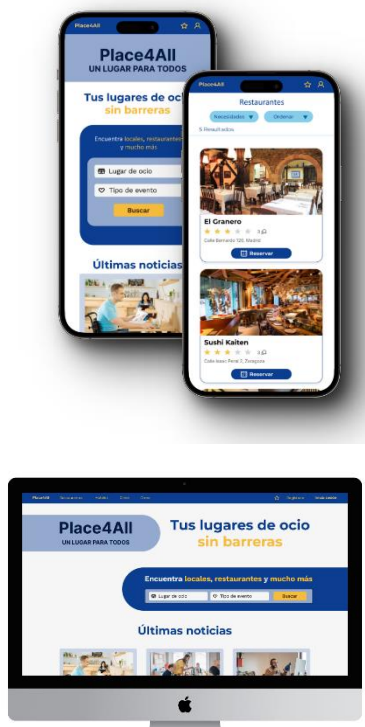


## CASE STUDY

Organisation	San Valero Centre
Type of organisation	Vocational training centre
Region/County/Municipality	Aragon / Zaragoza
Name of initiative	404 Simulator
"Sector (Manufacturing, energy, healthcare, agriculture)".	Mechanical manufacturing
Short description of the initiative	VR simulator for the assembly and disassembly of different parts of a lathe.
Geographical scope	Local
Public info:	

- Initiative description

Place4All is an innovative initiative that aims to solve a very real problem: the social exclusion of people with special needs when it comes to leisure. For many people with disabilities or mobility limitations, finding a place that offers the services they need can be a daunting and frustrating task. That is why Place4All has set out to simplify this process, serving as a mobility information hub, condensed into an intuitive and easy-to-use web application, with a view to a possible expansion to a native mobile app in the future.



The Place4All platform collects and provides relevant data useful for people with special needs. With this detailed information, users can easily navigate through the app and find the places that best suit their needs. In this way, people with reduced mobility can plan their outings and leisure experiences without worries and with complete peace of mind. Users can also contribute their own experiences and knowledge to improve the accuracy of the information provided. This increases the reliability of the application and ensures that all users benefit from accurate and up-to-date information.



# Tus lugares de ocio sin barreras



Encuentra **locales, restaurantes y mucho más**

## OBJETIVOS



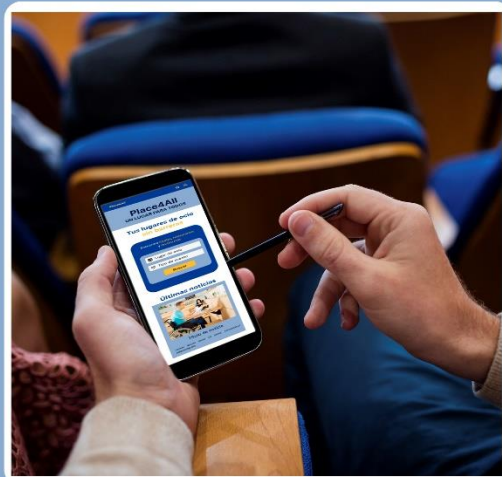
Favorecer la accesibilidad



Mejorar la inclusión social



Verificar información



## CONCLUSIONES

Favorecemos la visibilidad y el acceso de las personas con necesidades especiales a lugares de ocio

Hemos desarrollado una solución web que sirve como centro de información de movilidad

- methodology

The development of the project is based on the Learning and Service methodology. Although the project has a collaboration component with a company, the main objective is to create didactic applications for the classroom that can be used by their classmates in subsequent courses.

### *Results*

#### Achievements

The objectives of the project were.

- To provide an accessible and user-friendly solution for people with disabilities, enabling them to find entertainment venues with special services that meet their needs and enhance their experience when going out.
- Ensure that our solution is easy to use and accessible to all persons with disabilities.
- Promote social inclusion and support for people with disabilities.
- To make an ethical and social commitment to our community and work to improve their quality of life.

### *Transfer of knowledge*

The transfer of knowledge was carried out throughout the development of the project, as the student shared the progress of the project with the teaching staff at the project monitoring meetings.

The students experimented the results with the teachers and the application was tested by numerous social entities linked to disability in Aragon (Plena Inclusión Aragón, DFA, ONCE...). Demonstrations were carried out in several environments. Group of 1st and 2nd year of the CGS of web applications, CGM of attention to dependence, presentation at the ingenia awards and open day.

The students are currently studying the possibility of developing the application for actual implementation and are looking for support to make it public.

### *Resources.*

- Staff involved. Faculty of the Department of Computer Science. Project tutor (Alejandro Gimenez [agimenezg@svalero.com](mailto:agimenezg@svalero.com) and Vanesa Llorente [vllorente@svalero.com](mailto:vllorente@svalero.com)).  
2 students of the web application development cycle)
- Funding for the project. The project had no resources beyond those available to the school itself.

- Entities involved in the development of the application.
  - o DFA Foundation
  - o Plena Inclusión Aragón
  - o Cantattuti Choir
- Timing of the project. The project is integrated into the subjects of the second year of the higher level training cycle of WEB APPLICATIONS DEVELOPMENT. Throughout the course, hours of the different modules are allocated to the development of the project.

Links to extra documentation.

[Project report](#)

[Project presentation](#)

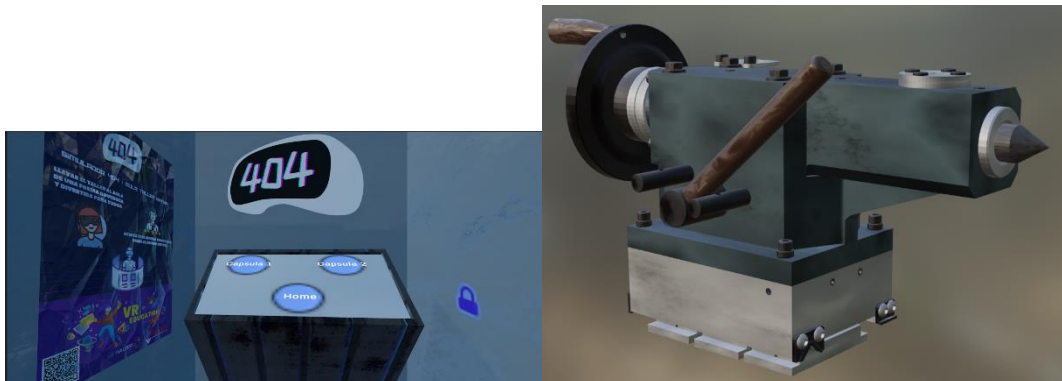
[Place4All Video](#)

## CASE STUDY

Organisation	San Valero Centre
Type of organisation	Vocational training centre
Region/County/Municipality	Spain/Aragon / Zaragoza
Name of initiative	404 Simulator
"Sector (Manufacturing, energy, healthcare, agriculture)"	Mechanical manufacturing
Short description of the initiative	VR simulator for the assembly and disassembly of different parts of a lathe.
Geographical scope	Local
Public info:	Links at the end of the document.

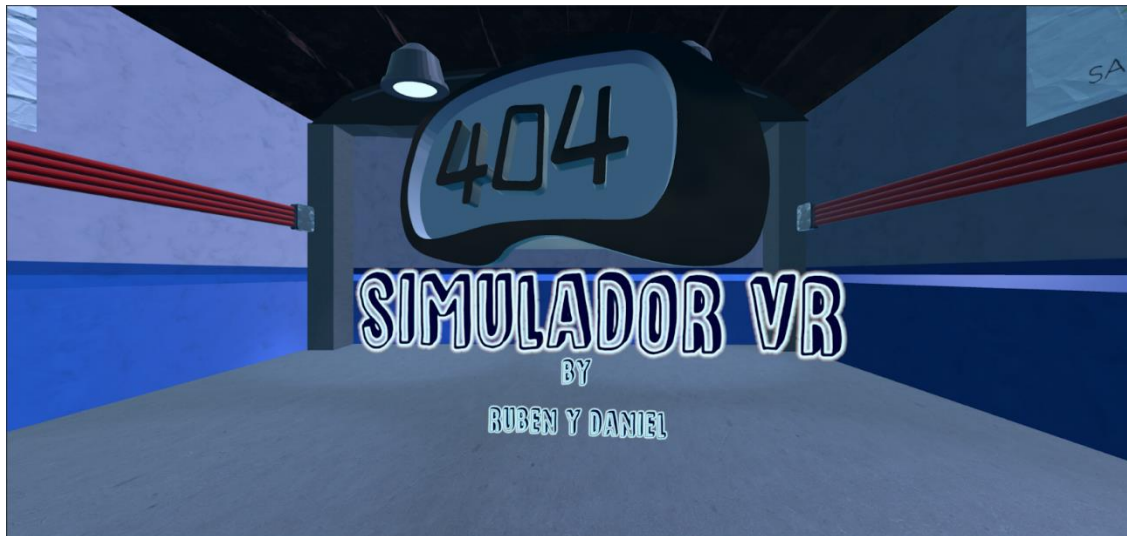
- Initiative

The project is an application for VR, intended to be used by vocational training centres to teach the maintenance and composition of a lathe. It can also be used by companies as an alternative to the usual technical service and employee training.

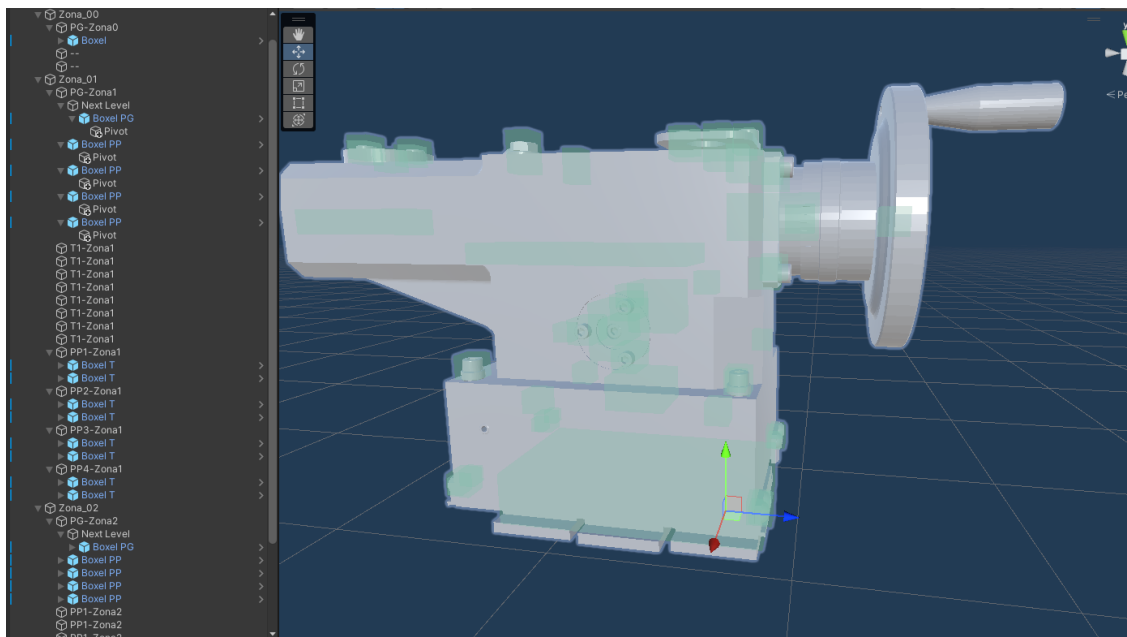


One of the objectives/reasons we have in mind for applying it in the educational sector is to provide safety for the students, as there is no danger in virtual reality. The machinery also does not deteriorate due to the use that would be given to it by being dismantled so many times. But it is also a more attractive way for more than one student to be able to carefully observe how the other students do it, because they can project on a blackboard what their classmate is doing, it would be the same as when a student goes to the blackboard to correct a class exercise, and everyone can see how they do it.





On the other hand, the objectives we have in mind for companies is the savings they will make by not depending on transport, as they will be able to hold videoconferences explaining to the customer the steps to follow in order to solve breakdowns. Even instructing employees on the most common breakdowns without relying on physical lathes that take up unnecessary space on the premises.



Currently, we have two educational pills, focusing on the counterpoint of the lathe. These are how the tailstock works and how to assemble it piece by piece.

- Results
  - Achievements

- Create two learning pills to help learn how to use the application.
- Have an application that is functional for the user and whose user rating is 7/10 in the test survey.
- Creation of resources to help visualise the content, such as highlighting interactive objects, explanatory texts in the pills and sound resources to help immersion in the application.
- To achieve an accessible and user-friendly environment for a learner.



- Results assessment
  - The students experimented the results with the teachers and conducted teacher training to enable teachers to use it. Demonstrations were carried out in various environments. 1st and 2nd CGS production programming group, ingenia awards presentation and open day.
- Transfer of knowledge

The transfer of knowledge was carried out throughout the development of the project, as the student shared the progress of the project with the teaching staff at the project follow-up meetings.

- Images

[Project report](#)

[Video simulator](#)

[Video handling of elements](#)

[Unity Video](#) Work environment and iteration with Counterpoint.

Participants	SAN VALERO VET	SME: PINACHO
Funding		



## CASE STUDY

Organisation	San Valero Centre
Type of organisation	Vocational training centre
Region/County/Municipality	Spain /Aragon / Zaragoza
Name of initiative	TELEMETRIC MODULE FOR DEAFBLIND PERSONS
"Sector (Manufacturing, energy, healthcare, agriculture)"	Electronics
Short description of the initiative	The project consists of the design and manufacture of a telemetric guide cane that gives blind people the ability to perceive distances by means of vibration sensations.
Geographical scope	Local
Public info:	<a href="#">CANE FOR DEAFBLIND PEOPLE</a>

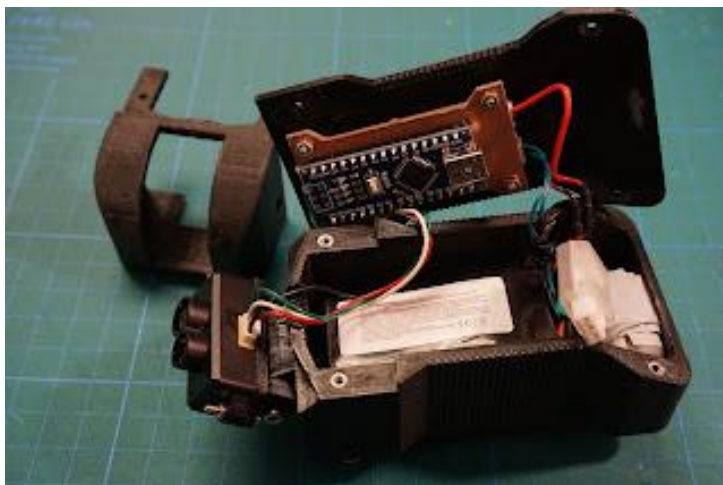
- Initiative

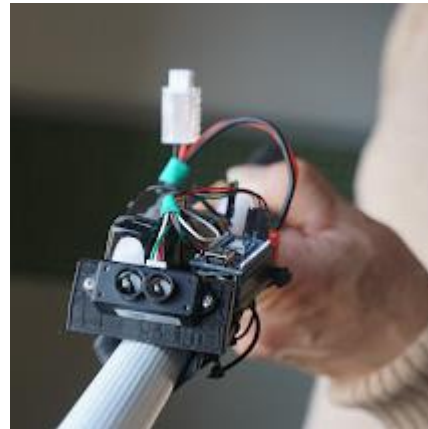
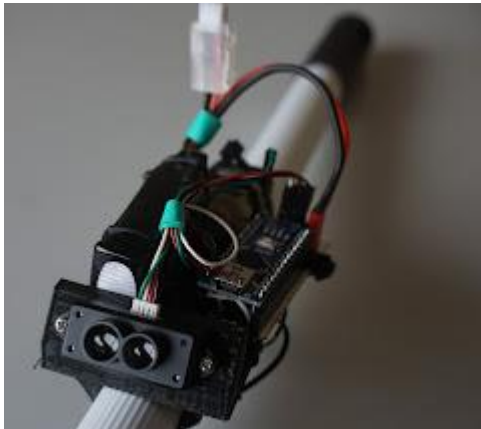
The project consists of the design and manufacture of a telemetric guide cane that gives blind people the ability to perceive distances by means of vibration sensations.



It is a battery-powered module that is mechanically attached to a traditional guide stick. The device measures distances with a laser sensor and the user can perceive them on the handle of the cane thanks to a small vibrator integrated in the module.

The system is designed in such a way that the information received by the user is not discrete (obstacle yes, obstacle no). The module constantly communicates the exact value of the measured distance to the user by vibrating the baton accordingly. Therefore, when the distance to the nearest object decreases, the vibration intensity increases proportionally.





A critical aspect of the module is that it measures distance practically in a straight line, i.e., in a very directional way. A simple sweep of the wand allows the user to obtain a great deal of information from his surroundings, even allowing him to recognise basic shapes, or to detect the number of people or entities present in his immediate environment.



The development of the project was based on the Learning and Service methodology. The student got in touch with the association that told him about the need he had and from there he developed the project.

- Results
  - Achievements

- Updating the traditional guide stick to a modern electronic version.
  - Adding telemetric functionalities to the traditional guide stick, but without renouncing to a normal use of the stick.
  - Prioritise the usability of the device over technical complexity. It must be a device that really brings value to the user when travelling.
  - Design a device that is easily repairable without the use of glues or mechanical joints that cannot be disassembled.
- Results assessment
  - The technical objectives of the project were met.
  - Two prototypes were designed and manufactured, one was given to the association and the other is kept at the school.
  - The student was able to include his intended functionality in the device, creating an accessible and inexpensive device that is easy to repair.
  - An important result of this project was the student's awareness of the reality of deafblind people, as he had to know what their needs were in order to adapt the design to something functional.
- Transfer of knowledge
  - The transfer of knowledge was carried out throughout the development of the project, as the student shared the progress of the project with the teaching staff at the project follow-up meetings.
  - All the information about the project is published freely on the electronics [department's blog](#) so that other students from the school or from outside the school can replicate the project.
  - The project was submitted to several competitions. Don Bosco 2020 Award - Ingenia Competition organised by the San Valero centre.
  - The student subsequently participated in a business incubator with a view to creating a start-up based on making electronics more accessible to people, seeking to design low-cost devices to solve people's needs.
- Images and extra documentation
  - [Drive project](#)
  - [Project report](#)
  - [Video defence of the project](#)
- Resources.
 

Staff involved. Faculty of the Department of Electronics. Project tutor (Javier Arnadillo [jarnadil@svalero.com](mailto:jarnadil@svalero.com))

Funding for the project. The project received a grant of 300 euros from the Ibercaja Foundation as part of the call for APS projects organised by the San Valero group.

Timing of the project. The project is integrated into the subjects of the second year of the higher-level training cycle in electronic maintenance. Throughout the course, hours of the different modules are allocated to the development of the project.

Participants	SAN VALERO	ASOCIDE ASSOCIATION
Funding	IBERCAJA BANK GRANT	

## CASE STUDY

Organisation	Curt Nicolin Gymnasiet
Type of organisation	VET centre
Region/County/Municipality	Sweeden
Name of initiative	Creation of a mould on a 3D printer for a metal tailstock
"Sector (Manufacturing, energy, healthcare, agriculture)"	Manufacturing
Short description of the initiative	A mould has been designed and manufactured for different performances of a metal tailstock. For this purpose, the mould was manufactured on powder 3D printers.
Geographical scope	The company sells his products all around the world
Public info:	

### Initiative

A design of the ideal tailstock that a Siemens CNC lathe should have has been carried out, based on different tailstock models. Mould prototypes have been manufactured using FDM technology from plastic powder raw material. Subsequent post-processing was carried out to cure the material and the final mould design was obtained. Different prototypes of tailstocks have been produced to see if the dimensions are suitable for the system. Once the exact dimensions of the tailstock had been identified, the final mould was manufactured in hardened steel for the mass production of the product.

### Methodology

- Results
  - Achievements

A tailstock suitable for the CNC machines used at Siemens has been developed to enable them to manufacture specific parts on their machines. The company has been able to develop a new tailstock with its ideal dimensions for the manufacture of its parts.

The school learned how to work with the prototyping process of moulding using design software and powder FDM technology 3D printers.

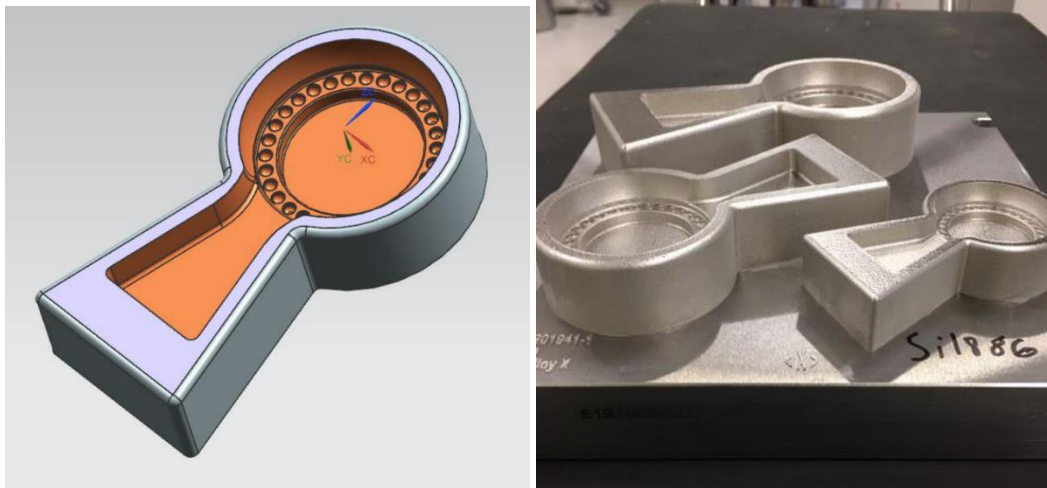
- Results assessment

Feedback from the company is the project's own assessment. The company had ordered a product together with its specifications and at the end of the project it was the specifications itself that carried out the verification of the project and its respective qualification.

- Transfer of knowledge

The knowledge generated is shared among the teaching staff of the different departments that have developed the project in order to be able to innovate the classes taught in the different specialities. In addition, the students have been able to study with a project that required a lot of precision and seriousness and have been able to know what it is like to be involved in a project of this nature.

- Images



Participants	Teachers	Students
Funding	SMEs funding	

## CASE STUDY

Organisation	York Technical College
Type of organisation	VET/University centre
Region/County/Municipality	USA / South Carolina / Rock Hill
Name of initiative	5-axis manufacture of hardened steel parts
"Sector (Manufacturing, energy, healthcare, agriculture)"	Manufacturing
Short description of the initiative	Manufacture of automotive mild steel parts using 5-axis machining technology
Geographical scope	The company sells his products all around the world
Public info:	

### Initiative

A hardened steel part with complex geometries has been manufactured for the automotive field. For this purpose, 5-axis machining technology was used, together with prior CAD/CAM processing. The part required a great deal of precision as it is an automotive part and its extreme hardness of 57 Rockwell C made its manufacture very complicated.

### Methodology

- Results
  - Achievements

They have managed to machine a part that without CAD/CAM technology and especially 5-axis manufacturing technology and the know-how to choose the right tools and machining parameters, would be impossible to manufacture and they would have to use the casting process, which is much more expensive and requires much more time to manufacture.

The school learned how to machine a complex part with complex geometry and extreme hardness in order to be able to machine it. Different machining parameters and new tools have been learned that have not been used in the centre until now.

- Results assessment



Feedback from the company is the project's own assessment. The company had ordered a product together with its specifications and at the end of the project it was the specifications itself that carried out the verification of the project and its respective qualification.

- Transfer of knowledge

The knowledge generated is shared among the teaching staff of the different departments that have developed the project in order to be able to innovate the classes taught in the different specialities. In addition, the students have been able to study with a project that required a lot of precision and seriousness and have been able to know what it is like to be involved in a project of this nature.

- Images



Participants	Teachers
Funding	SMEs funding



## CASE STUDY

Organisation	Universität Bremen
Type of organisation	University and Companies
Region/County/Municipality	Germany – Bremen
Name of initiative	MESA Media in Welding Education
"Sector (Manufacturing, energy, healthcare, agriculture)"	Manufacturing Welding
Short description of the initiative	Use of media in welding training
Geographical scope	Germany
Public info:	<a href="https://www.itb.uni-bremen.de">https://www.itb.uni-bremen.de</a>

## INDEX

The MESA project – use of media in welding training focused on the use of digital media for vocational training in the welding industry.

Embedding simulations in initial and continuing vocational education and training is a complex challenge, as the optimal use of digital media in vocational education and training also requires integration into learning theory. This requires in particular, the design of teaching-learning arrangements that explicitly meet the requirements of a both context-specific and simulation-based learning.

This is where the MESA project came in, in order to integrate digital media into demand-oriented and didactically sound training and further education measures. In order to guarantee the most practical orientation and good usability of the project results, close cooperation and applied research with representatives of industrial companies, educational institutions and associations had been pursued. The project results had been published in the form of a guideline. (<http://mesa.ikap.biba.uni-bremen.de/wp-content/uploads/2019/04/MESA-Abschlussbericht.pdf>) The task and innovative approach of MESA therefore lay not in the development of new technologies, but in their embedding in a demand-oriented and cross-technology blended learning system for the welding industry.

Research Methods:

- Identification of Work Processes and training needs
- Prototyping of VR Environment with welding simulators.
- Design based Research to develop and evaluate training material.

Methodology

- Results
  - Achievements: Training Modules for VR Learning in the welding process
  - Transfer of knowledge: Guideline of Training.



Participants	Researchers	Company trainers	Employess
Funding	Public funding BMBF	Own funding of company	Own funding of company

## CASE STUDY

Organisation	Universität Bremen
Type of organisation	University and Companies
Region/County/Municipality	Germany – Bremen
Name of initiative	Futurebox for veterinary assistants
"Sector (Manufacturing, energy, healthcare, agriculture)"	VET Education –Research of Learning Processes
Short description of the initiative	
Geographical scope	Germany
Public info:	<a href="https://www.itb.uni-bremen.de">https://www.itb.uni-bremen.de</a>

## INDEX

Learning processes in VET Education that are asynchronous in time and take place at different locations require new concepts and tools to make individual learning experiences visible and to enable exchange with teachers or peers. E-portfolios offer a wide range of possibilities here, in particular the training portfolio called Futurebox. The web-based tool promotes the linking of learning experiences at different learning locations and also functions as a digital training record. This field report offers a theoretically informed insight into the cooperative process of developing and implementing the training portfolio in the vocational training of veterinary assistants and highlights success factors of e-portfolio work in vocational training.

### Research Methods:

- Identification of Vocational field of expert training needs (interviews and Observation)
- Prototyping of an Learning environment with the futurebox (Expert Workshops)
- Desing Based Research to develop and evaluate Learning material.

### Methodology

- Results
  - Achievements: Futurebox approach to reflect learning content of a whole Occupation
  - Transfer of knowledge: Open Source tool and guidelines

Participants	Researchers	VET teachers	Students
Funding	Public funding BMBF	Own funding of VET School	No funding

## CASE STUDY

Organisation	Orange GmbH
Type of organisation	Company
Region/County/Municipality	Germany Hamburg Bremen
Name of initiative	Diginet.Air
"Sector (Manufacturing, energy, healthcare, agriculture)"	Engineering and CAD Manufacturing
Short description of the initiative	Digitalisation of SME
Geographical scope	Metropolregion Hamburg
Public info:	<a href="https://orange-engineering.de">https://orange-engineering.de</a>

## INDEX

The project "DigiNet.Air – Digital Learning Network in the Aviation Industry of the Hamburg Metropolitan Region" aims to support and accompany small and medium-sized companies in digital structural change. To this end, DigiNet.Air develops low-threshold and project-like formats that are directly geared to operational issues and are intended to support small and medium-sized enterprises (SMEs) in dealing with Industry 4.0 and Work 4.0 topics.

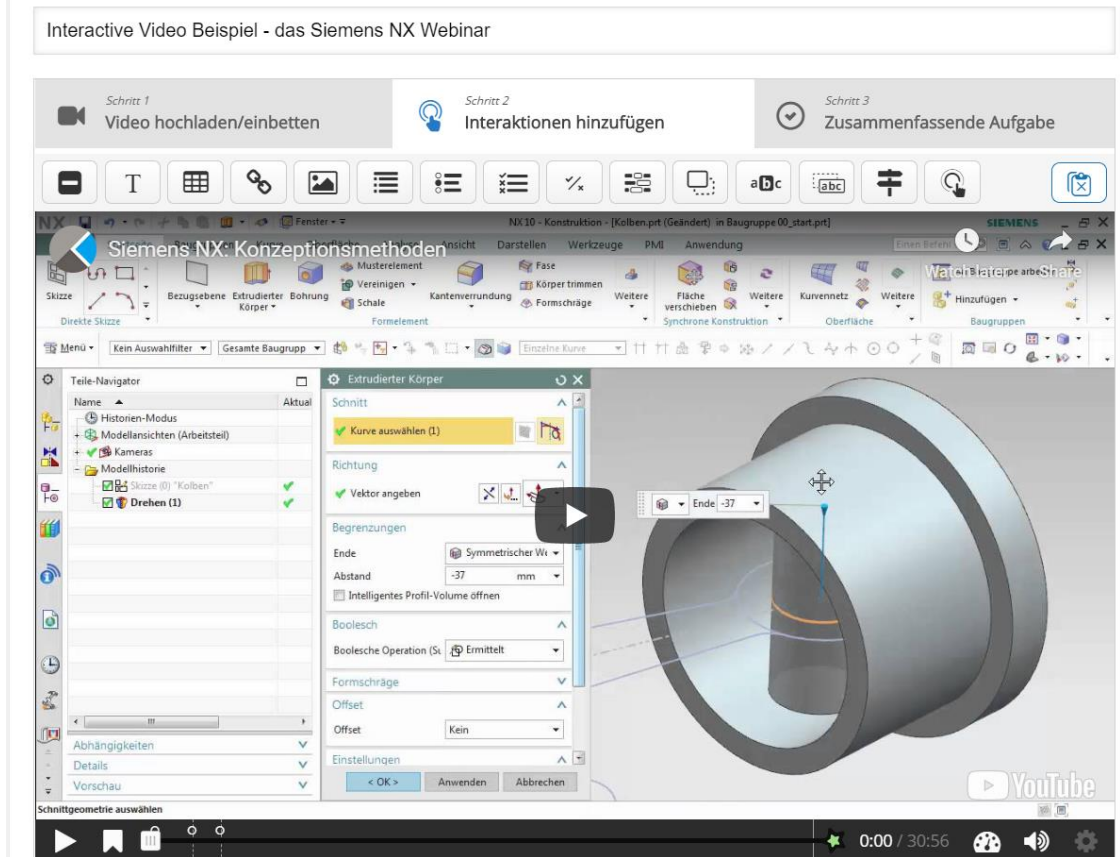
In this case study a process analysis was carried out at the Bremen location of Orange Engineering. The aim was to find out whether the desired target state of making the training of new employees faster and more efficient can be achieved with the H5P technology. For this purpose, H5P was presented and this solution approach was discussed together.

The research methods were Work Process Analysis and Competence Profiling.

- Analysing actual status
- Defining new status together Identification of training needs
- Solution: H5P-Videos
- Technical guidance and training
- Implementation at work environment

## Methodology

- Results
  - Achievements: a new digitalized training System with interactive technology H5P for the training of new employees,
  - Results assessment
  - Transfer of knowledge



Participants	Researchers	Company trainers	Employess
Funding	Public	Own funding of company	Own funding of company

## CASE STUDY

Organisation	Zentraler Fachausschuss Medien
Type of organisation	Association, University and Companies
Region/County/Municipality	Germany
Name of initiative	Social augmented Learning
"Sector (Manufacturing, energy, healthcare, agriculture)"	Print production and Vocational training
Short description of the initiative	Application of augmented reality for VET
Geographical scope	Germany
Public info:	<a href="https://www.social-augmented-learning.de">https://www.social-augmented-learning.de</a>

## INDEX

The aim of the Social Augmented Learning (SAL) case study was it, to use social learning, mobile learning and augmented reality to create a new form of teaching and learning for VET.

The project developed a new learning application for media technologists and print media technologists. Through augmented reality, which enables the visualization of processes on running printing machines, the learners are enabled to the develop a process understanding of their work environment. The black box of modern Machines can be opened up to some extent. The inside of a modern printing machine can be shown with enriched learning materials.

Interactive exercises on the machine supports the development of action competencies for VET workers and to understand their own work processes,

The training can be undertaken on Smartphones and tablets with self-directed learning pathes. This allows the trainees to be independent and flexible, independent of learning location and at any time, but nevertheless content-led, on the virtual printing system.

Operating, service and maintenance situations can be simulated on a mobile basis and specified tasks can be solved.

### Research Methods:

- Identification of Work Processes and training needs
- Prototyping of AR Environment with UX- and UI Approaches.
- Agile Development of an authorware for AR Learning

### Methodology

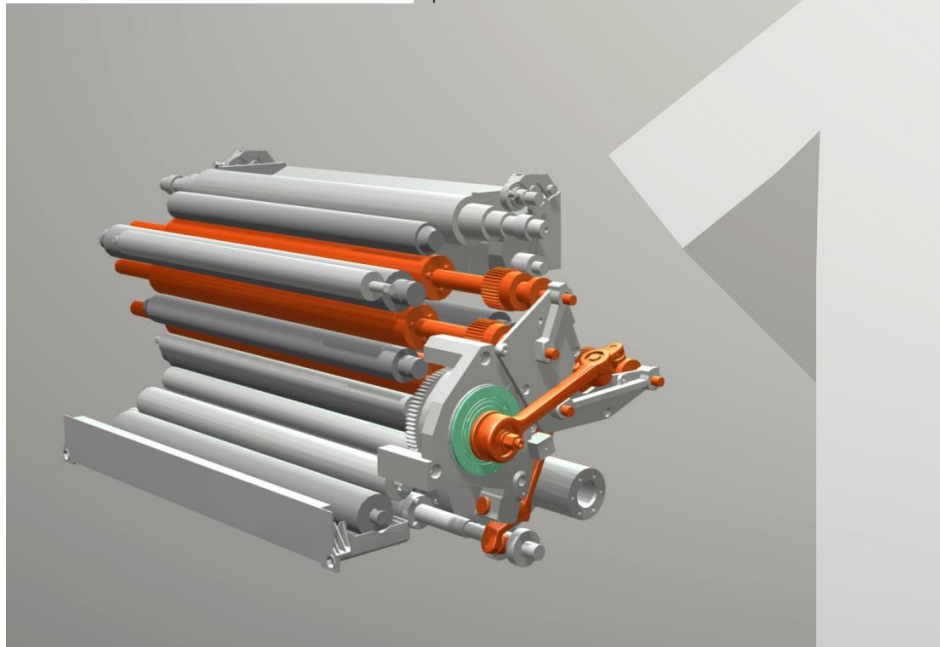
- Results
  - Achievements: A framework for AR Learning and a printing press
  - Transfer of knowledge: Project has been extended to social virtual learning.





**S A L** SOCIAL AUGMENTED LEARNING

HANDBÜCHER FÜR DEN EINSATZ VON SOCIAL AUGMENTED LEARNING



Participants	Researchers	Company trainers	Employess
Funding	Public funding BMBF	Own funding of company	Own funding of company



## 9. Colophon



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**AIRinVET partners:** TKNIKA – Department of education Basque Government, EURASHE, Berufliche Hochschule Hamburg, Hanse Parliament, KATAPULT, ISSO, AFM Cluster for Advanced & Digital Manufacturing and IMH – Advanced and Digital Manufacturing Campus.



**Co-funded by  
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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

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