



Deliverable D.2.1.

TRANSFORMATION ROADMAPS for UiT, KAU and TUV

June 2023

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**Document information**

D.2.1. Transformation Roadmaps for UiT, KAU and TUV	
Project/Grant Agreement number	<i>101100494</i>
Project title	<i>Strengthening European Entrepreneurial Development</i>
Project acronym	<i>SEEDplus</i>
Project start date	<i>01/04/2023</i>
Project end date	<i>30/06/2025</i>
Project duration	<i>27 months</i>
Work Package	<i>WP2. Pathways to expand entrepreneurial ecosystems</i>
Deliverable lead	<i>KAU</i>
Author(s)	<i>O. Voropai, L. Hladchenko, I. Kubareva., T. Abu-Alam, A. Marinov</i>
Type of deliverable (R, DEM, DEC, other)	<i>R</i>
Dissemination level (PU, SEN, CI)	<i>PU</i>
Date of first submission	<i>30 June 2023</i>
Revision n°	<i>Version 4</i>
Revision date	<i>5 August 2024</i>



Content

Executive Summary	3
1. Entrepreneurial Education at Technical Universities	4
1.1. Universities and Deep Tech Entrepreneurship	4
1.2. UiT, KAU and TUV: Brief Overview	5
1.3. Scope of the Roadmaps	9
2. Roadmaps development	11
2.1. Approach towards the development of the roadmaps	11
2.2. Audit methodology	11
2.3. Audit summary	13
3. The Transformation Roadmaps to 2025	80
3.1. Technical University of Varna (TUV)	80
3.2. The Arctic University of Norway (UiT)	83
3.3. Kyiv Academic University KAU	87
3.4. Synergies	91



Executive Summary

The changes in management approaches related to scientific research (knowledge creation) and commercialization of their results are caused by the shifts in priorities from technical and economic issues to the human-centred, sustainable and socially significant dimensions under transition to Industry 5.0.

Deep tech companies have a strong research base that ensures the development of new solutions. At the same time, successful deep tech ventures need entrepreneurs with up-to-date mindsets and skills which require new concepts of entrepreneurial education.

Being a part of the innovation ecosystem, technical universities enhance students' abilities to explore business opportunities for their projects, and foster them in developing entrepreneurial skills. Three European Universities partnering in the SEEDplus project – the Arctic University of Norway (UiT), Kyiv Academic University (KAU) and Technical University of Varna (TUV) – joined their efforts in strengthening their capacity in training technical students in entrepreneurship, and supporting their business and innovative ideas.

To advance in these activities, each partner University aimed at preparing a transformation roadmap based on an audit of its entrepreneurial education and support system, and a study of their respective country's best practices in this field.

First of all, each University applied the HEInnovate framework for mapping their entrepreneurship education programmes and entrepreneurship support for university students. The HEInnovate approach identifies eight dimensions of HEI's operational and strategic activities, which enables the assessment and development of entrepreneurial and innovative capacity¹:

- (1) Organisational capacity – people, resources, incentives and rewards
- (2) Preparing and supporting entrepreneurs
- (3) Entrepreneurial ecosystem and networks
- (4) Impact of the entrepreneurial HEI
- (5) Leadership and governance
- (6) Entrepreneurial teaching and learning
- (7) Digital transformation and capability
- (8) The internationalised institution

¹ Note: in previous versions of the HEIselfassessment different names were used for some of the dimensions: Measuring impact = Impact of the Entrepreneurial HEI; Entrepreneurial Ecosystem and Network = Knowledge Exchange and Collaboration. During the initial research phase an older version was available for self-assessment, while later on an updated one was presented by the HEInnovate team. We might use these names interchangeably within the current document.



As focus was put on the entrepreneurial training and support for students, the UiT, KAU and TUV embraced three dimensions mostly relevant to the project objectives:

- Entrepreneurial Teaching and Learning
- Preparing and Supporting Entrepreneurs
- Entrepreneurial Ecosystem and Networks

Drafting a roadmap includes 3 stages: (1) internal and external audit to identify the current level of entrepreneurial education and supporting activities at KAU, UiT and TUV through the HEInnovate self-assessment tool; (2) summary of identified pain points and good practices; (3) outlined actions for the university to improve its effectiveness as an entrepreneurial and innovative higher education institution.

The results of audit demonstrate that (1) each university has its own strengths that can be further shared and exploited within the consortium; (2) UiT is the leader among three universities on all eight dimensions, although it doesn't get the maximum points for any HEInnovate dimensions; (3) Entrepreneurial Teaching and Learning is one of the weakest elements for all three universities, and they need to address this dimension in their transformation roadmaps.

The UiT scored 4.5 (max score - 5) for Leadership and Governance, Preparing and Supporting Entrepreneurs, Entrepreneurial Ecosystem and Network, and Internationalized Institution. KAU demonstrated positive results in collaboration and engaging external stakeholders to the curriculum co-design and delivering process. Varna achieved favourable results in entrepreneurship research, preceding the educational offer development. These conclusions will be further used for the Synergy section of Transformation Roadmaps.

1. Entrepreneurial Education at Technical Universities

1.1. Universities and Deep Tech Entrepreneurship

The transition to Industry 5.0 is a change in the priorities of innovative development from a technical and economic dimension to a human-centred, sustainable and socially significant one. The problems of society and the planet as a whole are the focus of attention when developing new products and services, implementing new methods of production. This is the main difference between Deep Tech entrepreneurship and innovative entrepreneurship of the previous era.

This determines the change in management approaches related to scientific research (knowledge creation) and to the commercialization of their results.

Deep Tech are defined as disruptive solutions built around unique, protected or hard-to-reproduce technological or scientific advances. Deep tech companies have a strong research



base. They create value not only by disrupting business models, but also by developing new solutions. Four main attributes of Deep tech ventures are the following²:

- They are problem-oriented, not technology-driven.
- They situate themselves at the convergence of technologies.
- They build on the ongoing digital transformation and the power of data and computation to mostly develop mainly physical products, rather than software.
- They rely on a deeply interconnected ecosystem of actors, without which it cannot thrive.

Successful deep tech ventures search the best existing or emerging technologies while rooting themselves in science and advanced engineering to solve the problem and thus often generating defensible IP. Research and technical universities therefore become increasingly more valuable breeding grounds for deep tech entrepreneurs of tomorrow. Artificial Intelligence, Quantum computing, Synthetic biology, Nanotechnology, NextGen UX (Augmented/Virtual Reality), Blockchain, Robotics, Universal Printing and other powerful technologies are converged in products and services supporting the evidence that “Deep tech can transform the world as the Internet did.”³

Interconnected system of actors as a quadruple helix model of knowledge creation, involves not only businesses, research and educational institutions and government, but also civil society and public. Quadruple helix model is the approach that the European Union has intended to take for the development of a competitive knowledge-based society, with an increased role of culture values, civil society citizens' creativity and involvement in innovation processes⁴.

Therefore, there is a need for entrepreneurs with new mindsets and skills. It also implies a need for new approaches to entrepreneurial education.

Technical and research universities play the central role in developing such mindsets facing the need of transformation of its entrepreneurial education programs.

1.2. UiT, KAU and TUV: brief overview

Three European universities are participating in the SEEDplus project to advance their capacity and expertise in teaching entrepreneurship to technical students and supporting their business and innovative ideas.

The Arctic University of Norway (UiT)

The Arctic University of Norway (UiT) is a medium-sized research university that contributes to knowledge-based development at the regional, national and international level. It is the northernmost university of the world. Its location on the edge of the Arctic implies a mission. The Arctic is of increasing global importance. Climate change, the exploitation of Arctic resources and environmental threats are topics of great public concern, and which the University of Tromsø takes special interest in.

² https://hello-tomorrow.org/wp-content/uploads/2021/01/BCG_Hello_Tomorrow_Great-Wave.pdf

³ Ibid, p. 5

⁴ https://ec.europa.eu/commission/presscorner/api/files/document/print/en/speech_97_254/SPEECH_97_254_EN.pdf



Life in the High North is shaped by wild nature, contrasting light and weather conditions, geographic distances and multiculturalism. Many of UiT's research centres and study programmes reflect the specific character of Arctic Norway.

UiT's study portfolio covers all classical subject areas from Health Sciences, Social Sciences, Education and Humanities, Science and Technology to Economics, Law, Social Work, Tourism, Sports and Fine Arts. UiT's key research focuses on the polar environment, climate research, indigenous people, peace and conflict transformation, telemedicine, medical biology, space physics, fishery science, marine bioprospecting, linguistics and computational chemistry.

UiT's Centre for Advanced Studies in Theoretical Linguistics, CASTL, and CTCC, Centre for Theoretical and Computational Chemistry, have both been designated Norwegian Centres of Excellence. In 2002 the Tromsø-based NST, Norwegian Centre for Telemedicine, was appointed a World Health Organization Collaboration Centre. The ARCTOS network at the Faculty for Biosciences, Fisheries and Economics, is a leader in research on marine arctic ecosystems and an important partner of the Norwegian Polar Institute in Tromsø. The Department of Physics focuses on northern lights and space research. All these institutes are of high international reputation.

The university is part of the FRAM – High North Research Centre for Climate and the Environment (Fram Centre) in Tromsø. Every January the international conference Arctic Frontiers invites researchers, politicians and business representatives to discuss Arctic issues across disciplinary borders. The Secretariat of the Arctic Council is located at the Fram Centre. Researchers from the University and Fram Center are involved in several international programmes of the Arctic Council.

15500 students and 3300 staff study and work at UiT. Teaching is research-based. UiT's eight faculties offer, in spite of a dedication to Northern issues, a broad range of study programmes. The academic community in Tromsø is highly international. More than 20% of the academic staff and 10% of the student body are from abroad. The University offers more than 20 English taught master's degree programmes, and all faculties offer English taught courses at both bachelor's and master's level.

UiT is a founding member of the University of the Arctic, an international network of 160 study and research institutions of the circumpolar region. But the University cooperates with all parts of the world. 200 international agreements secure an active academic exchange of students and staff with partner institutions worldwide.

The University of Tromsø has been through three mergers. On the 1st of January 2009 UiT merged with the University College of Tromsø, and on the 1st of August 2013 with the University College of Finnmark. The latest merge was on the 1st of January 2016 with both the University College of Harstad and the University College of Narvik.

After the merger, UiT has become a multi-campus university spread throughout Northern Norway. The main campuses are located in Tromsø, Alta, Narvik and Harstad, with smaller departments in the towns of Mo i Rana, Hammerfest and Kirkenes. The number of students and study programmes increases due to this merger. The new university has become an even more important driving force for Northern Norway and international cooperation in the High North.



UiT faces many challenges related to the lack of innovative ideas developed by students, especially in relation to solving pressing climate challenges, which are very prominent in the region. Traditional businesses have failed to address the climate crisis and increasing demand for resources and space. Creating new startups that promote innovative ideas (e.g., blue growth and green transition ideas) and improving entrepreneurial skills of students are urgent needs for the local society. In addition, UiT currently has very limited support infrastructure for student business ideas in terms of formal education offered to students of technical faculties, advisory, incubation or financial support.

Kyiv Academic University KAU

The State Research Institution «Kyiv Academic University» (in short - Kyiv Academic University or KAU) is a Ukrainian research-intensive university, jointly run by the National Academy of Sciences of Ukraine (NAS of Ukraine) and the Ministry of Education and Science of Ukraine. The university was established in 2016 through the reorganisation of the Physical and Technical Educational and Scientific Center of the NAS of Ukraine (formerly the Kyiv branch of the Moscow Institute of Physics and Technology). The key principle behind KAU is "learning by doing research internationally" - to provide a research-intensive education system by leveraging the expertise of research institutions within the NAS of Ukraine, while also promoting integration with the European Research Area and fostering international collaborations with leading research universities worldwide.

KAU uses a research-intensive education approach where students learn by doing research internationally. This involves hands-on learning through active engagement in research projects, often with international collaborators and always with the leading scientists from the National Academy of Sciences of Ukraine. By participating in global research, students gain valuable experience working with diverse teams and in cross-cultural communication, preparing them for careers in a globalised world.

KAU's main activities include scientific research, education, innovation, and dissemination. In scientific research, students and scientists collaborate on cutting-edge projects across a range of fields. The university's educational activities involve top scientists from the NAS of Ukraine who have extensive experience in international cooperation, teaching students and conducting joint research. The KAU Innovation Centre coordinates and implements technology transfer tools, increasing the technology and market readiness of innovations within KAU and academic institutes, and establishing a Deep Tech Science Park "Academy.City." Finally, the KAU Creative Media Lab launches initiatives to promote scientific education, research, and popular science in Ukraine.

Transformation of the 'brain drain' into 'brain circulation' is one of the critical challenges for KAU. It requires an individual approach such as giving every student a clear understanding of scientific career opportunities based on individual skills and preferences combined with well-established long-term scientific collaborations with the US and European research centres.

The strength of KAU lies in close conjunction of the educational process at the departments and research centres at the basic academic institutions, where interdisciplinary studies of the most relevant areas of modern science take place. KAU has multiple departments at the research institutions of NAS of Ukraine.



1. Department of Applied Physics and Material Science (based at the Paton Institute of Electric Welding)
2. Department of Applied Physics and Nanoscale Systems (based at the Kurdyumov Institute of Metal Physics)
3. Department of Fundamental Problems of General and Applied Physics (based at the Institute of Physics)
4. Department of Biomedicine and Neuroscience (based at the Kyiv Academic University);
5. Department of Theoretical and Mathematical Physics (based at the Bogolyubov Institute for Theoretical Physics)
6. Department of Mathematics (based at the Institute of Mathematics)
7. Department of Theoretical Cybernetics and Optimal Control Methods (based at the Glushkov Institute of Cybernetics)
8. Department Molecular Biology and Biotechnology (based at the Institute of Molecular Biology and Genetics)

Currently, KAU Innovation Center aims to launch a Deep Tech Science Park “Academ.City” (<https://kau.org.ua/en/science/innovation/academ-city>) partnering with 12 research institutes of NAS of Ukraine located in the Akadmistechko district in the north-west of Kyiv as a place-based innovation ecosystem to increase Technology and Market Readiness Levels (TRL and MRL) of regional innovations. We collaborate with Kyiv regional authorities, businesses, and NGOs to achieve this aim. First of all, we are going to focus on Kyiv region smart-specialisation areas such as biotech, green technologies, IT, creative industries, production of innovative food products with improved consumer qualities (functional food), development of energy-efficient solutions based on alternative energy sources, innovative products for construction, design and everyday life, bioactive substances and pharmaceuticals for human health. Moreover, research areas of excellence will include AI and machine learning, bioinformatics and systems biology, advanced materials, nanotechnologies, quantum technologies, and the energy sector.

Technical University of Varna (TUV)

The Technical University of Varna (TUV) was founded in 1962 by a Decree of the Council of Ministers of the People’s Republic of Bulgaria and Act of the National Assembly. The purpose of its establishment was to ensure conditions for education of engineering staff for shipbuilding, transport, machine building, electric power engineering and communications. Initially, the university was named Higher Institute of Mechanical and Electrical Engineering-Varna and incorporated three faculties: Mechanical Engineering, Electrical Engineering and Shipbuilding. The first admission of students was for the 1963/64 academic year.

The Technical University of Varna is a state educational institution, which has accepted the challenge and the responsibility to serve the public needs for preparing qualified engineers and supporting the technical development in a world that undergoes global, technological and cultural changes. TU-Varna’s mission is to be a factor in the development of the intellectual potential of Bulgaria, to support the process of sustainable development and to contribute to the achievement of new standards in communication of people. As part of its role and based on close cooperation with the industry, the active research sector, the European universities and standing on its own achievements and traditions, TUV has to organise the creation of market-



oriented highly qualified specialists in all educational degrees for Bulgarian and the world economy, more specifically in the fields of:

- Shipbuilding and Navigation;
- Communication and Computer Engineering and Technologies;
- Mechanical Engineering and Technologies;
- Electrical Engineering, Electronics and Automation;
- Electric Power Industry;
- Industrial Management;
- Agronomy;
- Ecology and Technologies for Environmental Protection

The Technical University of Varna is the only Bulgarian civil university following the specific mission to integrate in a single process the education of engineers and the conduct of scientific research in the fields of shipbuilding and marine technologies, navigation and water transport, ecology and engineering technologies for sea environment.

TUV is one of Bulgaria's most prominent HEI in Engineering Technical Sciences With access to its 152 laboratories, TUV provides students with tutoring and technological support during development of product prototypes and pilots. TUV has a strong network of partners on the local and national level, including the connections to municipalities and other universities; this will help the project to reach out to our target audience and ensure that all activities run at the university level will produce expected outputs. Business partners will be mainly responsible for co-creating the new entrepreneurship curriculum, coaching student entrepreneurs, helping universities set-up entrepreneurship support infrastructure.

TUV works with many technically talented students in fields of high-demand, but very few startups are born from its ecosystem and a small number of graduates become self-employed. Several initiatives to improve the entrepreneurial skill sets of students have been piloted at TUV, including a bachelor program in Technological Entrepreneurship and Innovation, but without much success so far. TUV's leadership has set the priority to improve its innovation and entrepreneurial capacities to become a key innovation player in the Varna region.

1.3. Scope of the Roadmaps

Technical Universities as the participants of the innovation ecosystem are supposed to help their students, academic and non-academic staff to explore the business opportunities of their research projects and ideas, making their research relevant and accessible, and to enhance graduate employability. Those successful in the process are considered to be entrepreneurial and innovative higher education institutions. The HEInnovate approach⁵ identifies eight dimensions (see Fig. 1) of HEI's operational and strategic activities, which open opportunities to develop their entrepreneurial and innovative potential.

⁵Detailed description and a self-assessment tool available at www.heinnovate.eu

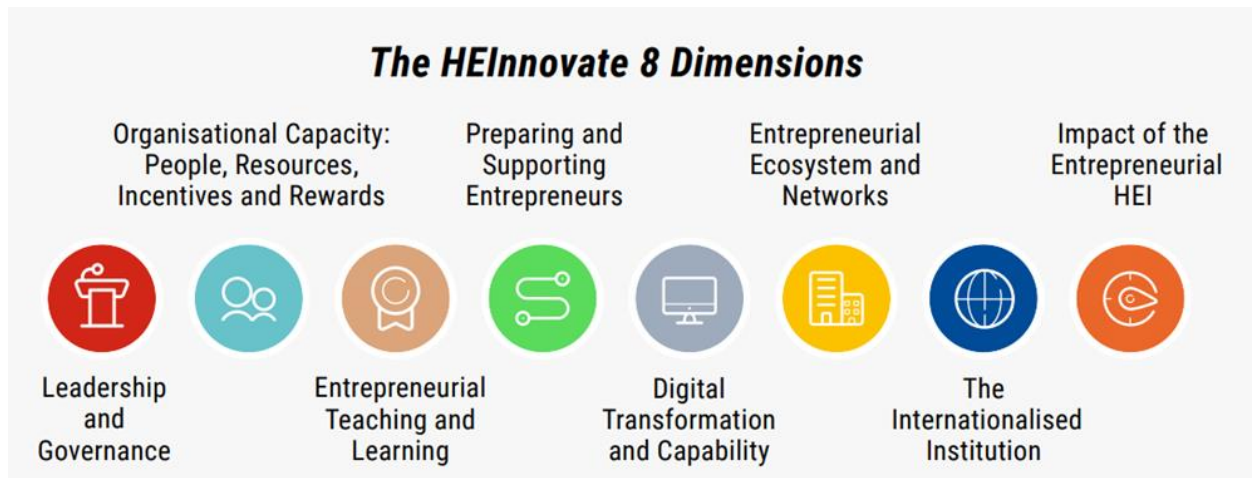


Figure 1. HEInnovate Self-Assessment dimensions

This document is aimed at designing the methodology and conducting the analysis to map existing entrepreneurship education programmes and entrepreneurship support activities for university students. As a result of this analysis, transformation roadmaps for entrepreneurial education and support within three partner universities - UiT, TUV and KAU are developed.

Though we understand that a university should progress on all eight dimensions to ensure the most successful transformation, not all of them will be in focus of our Roadmaps. We will mainly concentrate on three dimensions directly related to entrepreneurial education and entrepreneurship support for students and staff, namely:

- Entrepreneurial Teaching and Learning
- Preparing and Supporting Entrepreneurs
- Entrepreneurial Ecosystem and Networks

The main objectives of these Roadmaps are:

1. To audit the existing state of the entrepreneurial education and support at the participating universities using the HEInnovate framework.
2. To study the current state of technical higher education in Norway, Bulgaria, and Ukraine and the motivation of students to study technical specialities.
3. To map the existing entrepreneurial courses and entrepreneurship supporting activities at the leading universities of the three countries, where participating universities come from - Norway, Bulgaria, and Ukraine.
4. To define and describe good practices in entrepreneurial education and entrepreneurship support activities for students with technical background
5. To create a roadmap for each participating university for transforming their entrepreneurial education and support activities in order to improve the HEInnovate score on the corresponding dimensions.
6. To identify joint actions / synergies / future collaboration among all participating HEIs?

The Roadmaps provide a set of actions an university should take to improve its entrepreneurial performance. These actions will be tailored to the universities which are within the scope of



this report - KAU, UiT and TUV, taking into account the local innovation landscape, university size and other factors. Nonetheless, they may also be applicable to other universities, Therefore the general recommendations of the report will be disseminated to the wider audience, including the associated partners of the SEEDplus project.

2. Roadmaps development

2.1. Approach towards the development of the roadmaps

The three-step process was used to develop the Roadmaps as shown in Figure 2.

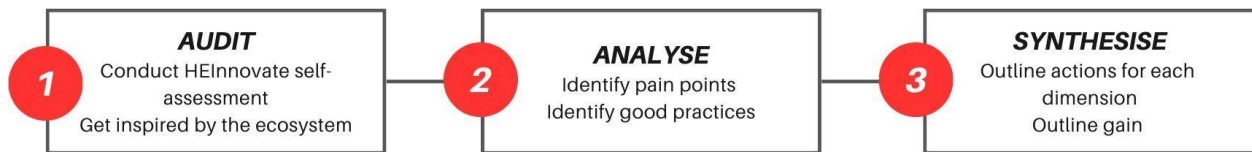


Figure 2. Roadmaps development process

Audit. The audit stage was aimed at identifying the current level of entrepreneurial education and supporting activities at KAU, UiT and TUV through the HEInnovate self-assessment tool. The broader landscape of the HEI entrepreneurial ecosystems in Bulgaria, Norway and Ukraine was then analysed to identify the good practices among universities within these local ecosystems. The general EU context was covered by the HEIs focus-group and best practices analyses from the EIT HEI Resource Hub.

Summarise. Based on the collected data, a conclusion was drawn on the dimensions of the entrepreneurial university, which need improvement at KAU, UiT and TUV, making a particular emphasis on those, directly related to education and support actions. Analysed educational courses at the leading universities in the countries involved were used to provide recommendations in terms of the educational scope and content. Good practices provided inspiration for the action plan.

Synthesise. The roadmaps contain a set of actions for each university to be taken across three HEInnovate dimensions to improve their effectiveness as an entrepreneurial and innovative higher education institution. The key pain points, as well as the actions benefits are outlined.

2.2. Audit methodology

The methodology of audit is formed in accordance with the scope and objectives of the transformation roadmap as well as taking into consideration EU practices.

Internal audit: HEInnovate Self-Assessment is performed to identify a starting point of the universities' entrepreneurial education. The HEInnovate survey was conducted among the main stakeholders of KAU, TUV, UiT, including the management team, students, academic and non-academic staff. A special attention is paid to "Entrepreneurial teaching and learning" and "Preparing and supporting entrepreneurs", and "Entrepreneurial Ecosystem and Networks" dimensions. Score for each dimension is in the range from 1 to 5.



The current survey results obtained at the beginning of the project are the starting point for developing a plan of transformation roadmap measures and a basis for comparison with the future survey results that will be obtained after the implementation of transformation measures. The results of HEI self-assessment before and after implementation of transformation roadmap proposals will be used to define the progress and reveal impact of improving activities for each HEI self-assessment dimension.

External audit: HEI Log, Log of disciplines, Entrepreneurial Support Activities review checklist, Entrepreneurial Support Infrastructure review checklist were developed on the basis of a brainstorming of experts in the field of higher education, deep tech education, entrepreneurship and innovation. The desk research approach was used for the audit of the different HEIs involved in the current study. This desk research employs data collected through different open sources (online platforms and documents).

The HEI Log for the study of the local landscape and ecosystem includes local higher education institutions, which were selected according to such criteria as: holding leading positions in the local rankings of technical higher education institutions, and higher education institutions with developed innovative and entrepreneurial ecosystems, defined by experts.

We collected available information from different sources (university websites, social media, news, regional innovation reports, educational programmes etc.) to understand the current state of the entrepreneurial knowledge and support available for students with technical backgrounds covering the following areas.

- Universities' Entrepreneurial Education: based on analysis of disciplines that form competencies in the field of entrepreneurship.
- Universities' Entrepreneurial Supporting Activities: explored via review checklist of defined activities that support entrepreneurship. It provides data about workshops, startup contests, entrepreneurship conferences/or sections, entrepreneurship journals, special digital support (labs, etc.), fundraising, grant programs, networking (partnership etc.) and regular participation in the events of other HEI, and defines special positioning of the university (research, innovation, etc.)
- Universities' Entrepreneurial infrastructure: checked through analysis of organisational units that provide entrepreneurship activities, networks and resources. It provides data about special centres for entrepreneurship and innovations, incubators, accelerators, technology transfer centres, innovative technology parks, startup schools, funding funds, and research infrastructure.

Survey Entrepreneurial Education at Technical Universities covers 12 questions, including information about current status at HEI, specialty (major), gender, country of residence, University name, motivation to study, value of entrepreneurial competencies for respondent, defining educational formats and areas of the process of acquiring entrepreneurial competencies, resources/platforms to obtain entrepreneurial knowledge and skills outside university, intentions to use acquired entrepreneurial competences. Studied set of entrepreneurial competences was defined on the base of EU EntreCompFramework.



Limitations. The first limitation is related to the HEInnovate Self-Assessment methodology that is used to assess innovative and entrepreneurial capacity. Since the survey according to this methodology for the development of the transformation map was conducted in May-June 2023, it does not take into account the updates of the methodology that were implemented on June 27, 2023. These updates will be taken into account when developing the transformation map recommendations.

The second limitation is related to the focus on only three dimensions of HEInnovate. The suggested roadmaps include the set of actions within these three dimensions, but the rest of them are also considered by the universities for their entrepreneurial development.

2.3. Audit summary

HEInnovate general picture

Results of the HEInnovate self-assessment for KAU, UiT and TUV are presented in Figure 3. The spider diagram clearly shows that UiT is the leader among three universities on all eight dimensions. Though it still has not reached the max of 5 points on any of the dimensions, the scores on Leadership and Governance, Preparing and Supporting Entrepreneurs, Entrepreneurial Ecosystem and Network, and Internationalised Institution are exceeding 4.5 points. Therefore UiT's experience in these fields is worth sharing with the rest of the partners. At the same time, it is obvious that despite all the efforts Entrepreneurial Teaching and Learning is one of the weakest elements for all three universities and they definitely need to address this aspect in their transformations.

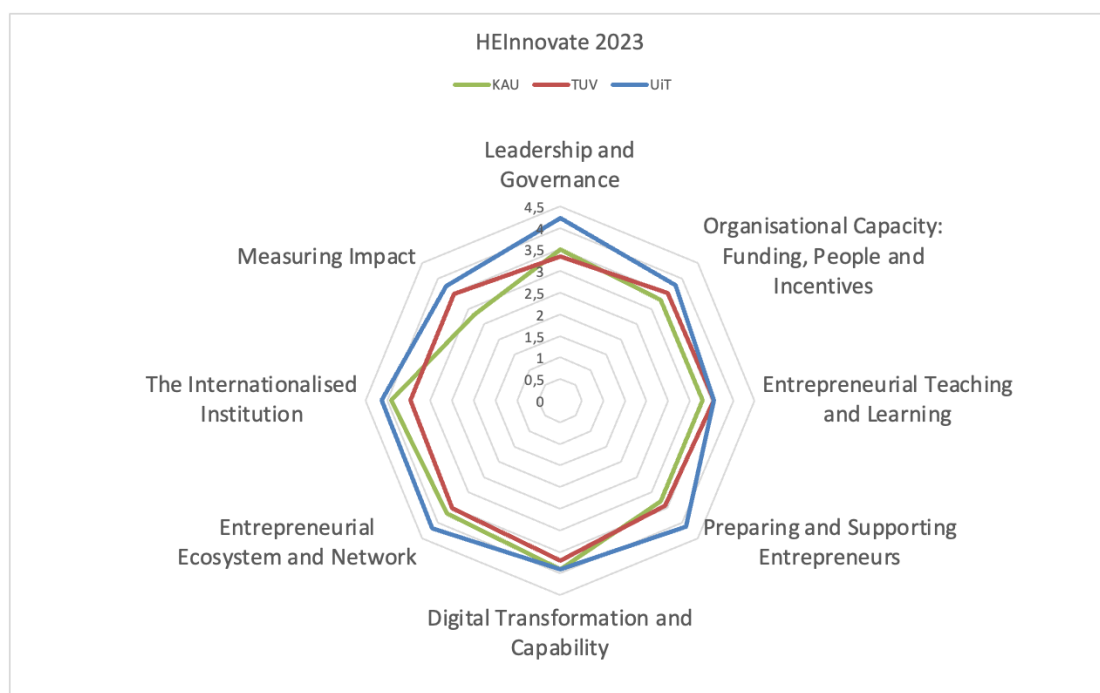


Figure 3. HEInnovate Self-Assessment results

A closer look at the main entrepreneurship-related dimensions for KAU, UiT and TUV allows us to distinguish the strengths of each partner to be further exploited within the consortium.



KAU is demonstrating good results in engaging external stakeholders to the curriculum co-design and delivering process, while Varna is good at entrepreneurship research, preceding the educational offer development (see Fig. 4).

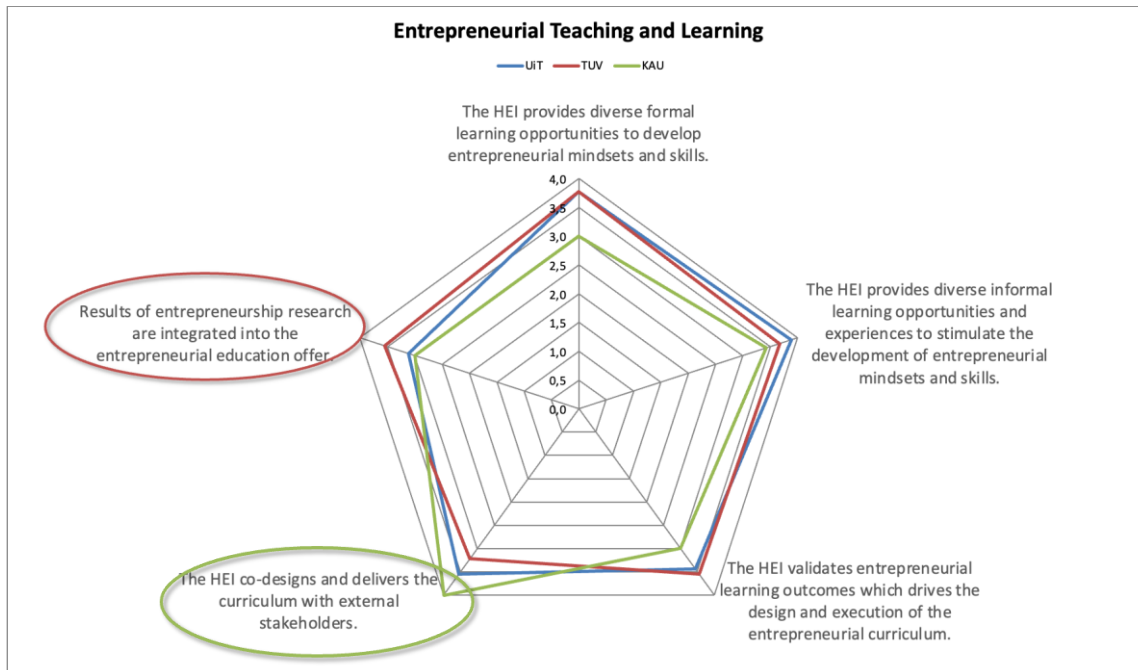


Figure 4. Entrepreneurial Teaching and Learning: Strengths and Weaknesses

UiT is the leader in the activities related to Preparing and Supporting Entrepreneurs. Its scores are higher than 4 on all parameters (except for training on running and growing the business) and much higher than the corresponding scores for KAU and TUV (see Fig. 5). Therefore, it would be beneficial to have UiT as an expertise provider when transforming this type of activities at two other universities. The same is true for Ecosystem and Network dimension (see Fig. 6). UiT is also demonstrating the best results and could help other partners advance into creating a more effective cooperation within the Quadruple Helix ecosystem. However, KAU's experience in collaboration and knowledge exchange with industry partners, public sector and society is worth taking into consideration as these relationships are harder to build in Emerging Innovators⁶ countries. Therefore the obtained knowledge and good practices are even more valuable.

We will use these conclusions to outline the actions for the Synergy section of Transformation Roadmaps. In the following section of this document we will provide a more detailed description of the HEInnovate self-assessment results for each of the three universities.

⁶ According to European Innovation Scoreboard https://research-and-innovation.ec.europa.eu/statistics/performance-indicators/european-innovation-scoreboard_en

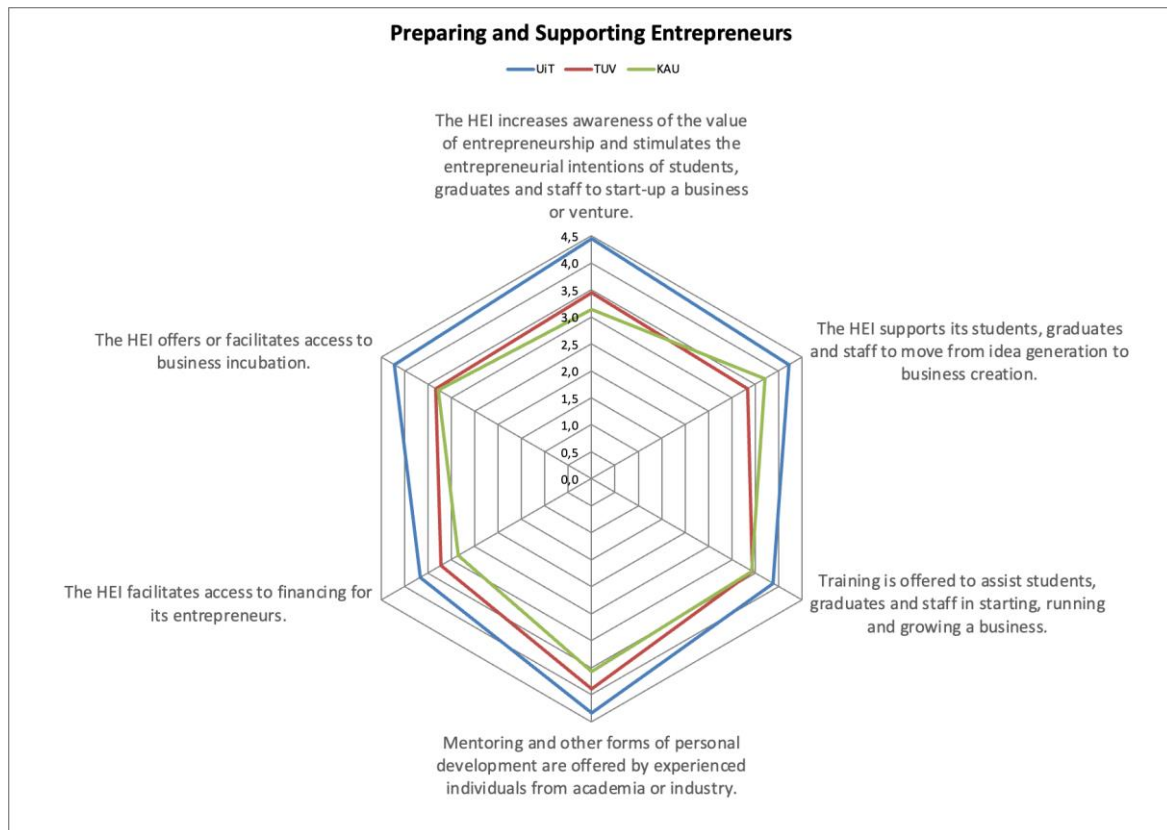


Figure 5. Preparing and Supporting Entrepreneurs: Strengths and Weaknesses

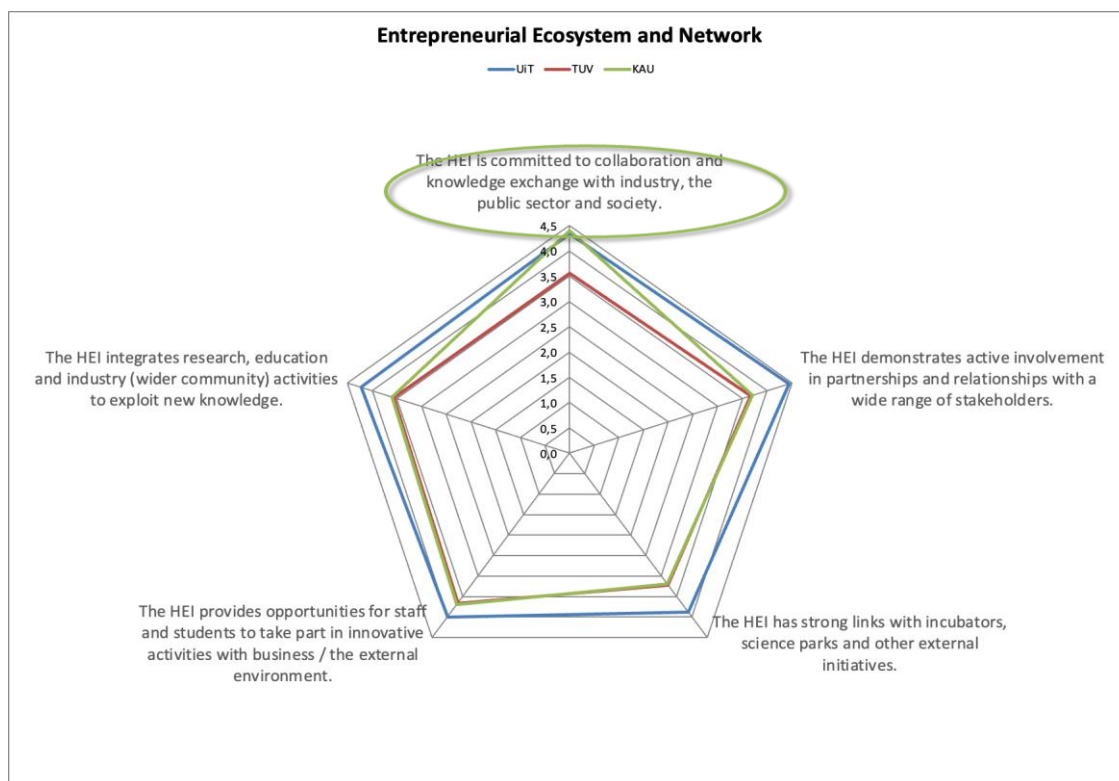


Figure 6. Entrepreneurial Ecosystem and Network: Strengths and Weaknesses



The Arctic University of Norway (UiT)

Regional landscape and good practices

The landscape of entrepreneurship education in Norway is well-structured, with numerous universities and colleges incorporating entrepreneurship and innovation programs into their curricula. These educational initiatives aim to equip students with the necessary skills and knowledge to initiate and manage their own businesses. UiT The Arctic University of Norway is among the institutions offering entrepreneurship education. Additionally, other esteemed universities for entrepreneurship education in Norway include:

Norwegian University of Science and Technology (NTNU): NTNU is a public research university located in Trondheim. It is one of the largest and most prestigious universities in Norway, and it offers a wide range of programs in engineering, science, and technology. NTNU also has a strong focus on entrepreneurship, and it offers a number of programs in this area.

University of Oslo: The University of Oslo is Norway's oldest and largest university, and it is located in Oslo. It offers a wide range of programs in all major academic disciplines, including entrepreneurship. The University of Oslo also has a number of incubators and accelerators that support student entrepreneurs.

BI Norwegian Business School: BI Norwegian Business School is a private business school located in Oslo. It is one of the leading business schools in Norway, and it offers a number of programs in entrepreneurship and innovation. BI Norwegian Business School also has a strong focus on research, and it is home to the Center for Entrepreneurship and Innovation.

Norwegian School of Economics (NHH): NHH is a public business school located in Bergen. It is one of the leading business schools in Norway, and it offers a number of programs in entrepreneurship and innovation.

University of Agder: The University of Agder is a public university located in Kristiansand. It offers a wide range of programs in all major academic disciplines, including entrepreneurship.

Nord University: Nord University is a public university located in Bodø, Tromsø, and Steinkjer. It offers a wide range of programs in all major academic disciplines, including entrepreneurship.

Based on our study, entrepreneurial education in Norway encompasses subjects integrated within bachelor's and master's level educational curricula, spanning domains like entrepreneurship, business management, marketing, research development commercialization, production economics, innovative growth, environmental stewardship and intellectual property as well as legal facets of entrepreneurship. These subjects are primarily incorporated as either mandatory or elective courses, often supplemented by broader economic and managerial studies, albeit lacking a concentrated emphasis on innovation and entrepreneurship. However, a drawback identified in this study pertains to the absence of courses catering to technical-based studies. Technical-based studies encompass fields rooted in science, technology, and



engineering. This includes subjects such as mathematics, physics, chemistry, biology, and computer science.

The Norwegian ecosystem is actively engaged in facilitating entrepreneurship through a diverse range of support activities. These encompass:

Entrepreneurship Education: Across Norway's higher education institutions, entrepreneurship education is a key focus, offered either as dedicated study programs or integrated into various courses. Additionally, primary and secondary schools benefit from government-backed funding for entrepreneurship education initiatives.

Financial Assistance: Entrepreneurs receive backing in the form of loans, grants, and loan guarantees from commercial banks, often facilitated by the government. A network of venture capital funds is also in place to invest in startup ventures.

Incubators and Accelerators: A robust ecosystem of incubators and accelerators provides entrepreneurs with essential resources like workspace and mentorship, fostering growth and development.

Networking and Matchmaking: Government-sponsored events promote networking and matchmaking opportunities, enabling entrepreneurs to connect with potential customers, partners, and investors.

Research and Development (R&D): The government allocates funds for research and development initiatives in sectors vital to Norway's economy, such as renewable energy and aquaculture. This research aids entrepreneurs in conceptualising and producing innovative products and services.

Complementing government initiatives, a variety of private organisations contribute to entrepreneurship support in Norway. Chambers of commerce, business associations, and non-profit organisations play an instrumental role.

The intent behind the Norwegian government's entrepreneurship support activities is to cultivate an environment that encourages entrepreneurial endeavours. These endeavours have yielded fruitful results, as demonstrated by the marked increase in the number of startups and small businesses within the country. Norway's prominence in global entrepreneurship rankings is a testament to the efficacy of these efforts.

Several specific instances of entrepreneurship support activities and infrastructures in Norway are noteworthy:

1. **The Forny2020 Program:** A government-funded initiative aimed at fostering innovation and entrepreneurship, the program provides funding for research and development ventures, as well as support for incubators and accelerators.
2. **Innovation Norway:** This government agency caters to businesses of all sizes, including startups. It extends a spectrum of services, encompassing financial aid, mentorship, and networking avenues.



3. **The Norway Innovation network:** This is a research organisation based in Oslo experienced in the field of innovation in; Environment & Climate change and Education. In its 5 years of operation, the organisation has been actively involved in the planning, implementation, and evaluation of projects at the European and national level under different thematic areas and specific topics such as ICT & Digital transformation, Climate Change (facilitating green transition & growing energy), Entrepreneurship and Social inclusion.
4. **The Norwegian Innovation Clusters:** The Norwegian Innovation Clusters is a network of businesses, organisations, and individuals that are working to promote innovation. The cluster provides a platform for collaboration and knowledge sharing, and it also offers support services to startups.

The analysis underscores two pivotal gaps hindering the advancement of Norway's entrepreneurship ecosystem. Firstly, there's a notable absence of tailored entrepreneurship education for students pursuing technical disciplines. Secondly, despite the Norwegian government's commendable commitment to fostering entrepreneurship through measures like program funding, tax incentives, and support, a distinct shortfall exists in extending these benefits to students from technical faculties. This discrepancy is particularly concerning as technical fields encompass essential domains such as science, technology, and engineering. The absence of specialised programs for these students limits their access to vital entrepreneurial resources, potentially impeding the growth of innovative ventures rooted in technical expertise. Consequently, the imperative for promoting inclusivity across all academic domains is undeniable, as it's pivotal to nurturing a comprehensive and equitable entrepreneurial ecosystem capable of harnessing the diverse potentials within it.

In the following section, five good practices from the Norwegian ecosystem will be presented:

Good Practice 1. [the Gründerskolen](#):

The Gründerskolen, known as The Norwegian School of Entrepreneurship, stands as a nationwide initiative aimed at imparting entrepreneurship education to students hailing from diverse corners of Norway. This comprehensive program offers an array of courses, workshops, and hands-on learning opportunities. Encompassing numerous universities and university colleges across the country, the program operates under the overarching academic and administrative stewardship of the University of Oslo.

The inception of The Norwegian School of Entrepreneurship dates back to 1999, when Professor Nils D. Christophersen established it within the Department of Informatics at the University of Oslo. The program commenced its journey in collaboration with Cornell University, embarking with a cohort of six IT students participating in San Francisco. Since that inaugural year, the program has experienced exponential growth, consistently hosting around 150 students in recent times. Notably, its alumni network surpasses 2000 members, establishing itself as the largest network of its kind in Norway.



The program's accomplishments have garnered notable recognition. In 2007, it received the esteemed "Best Quality in Higher Education" award from the Norwegian Ministry of Education and Research. Additionally, it was honored with the "Best Learning Environment" award at the University of Oslo in 2006. In 2012, the program clinched the prestigious title of "Best Startup Industry Provider" in the Norwegian Startup Awards, further solidifying its standing as a cornerstone of entrepreneurial education and support in Norway.

School's Vision

The primary objective of the Gründerskolen is to furnish students with a robust competency base and cultivate a favorable outlook toward entrepreneurship. While it is not anticipated that all graduates will embark on their entrepreneurial ventures, the program places significant emphasis on nurturing a constructive entrepreneurial ethos. Equally crucial is the cultivation of an awareness among well-educated youth about the pivotal role a positive entrepreneurial culture plays in Norway. This awareness extends to their active involvement in propagating this mindset across diverse strata, including research arenas, educational institutions, institutional frameworks, and various segments within the public sector, as well as within the private business realm.

Overall learning objective:

The students will gain knowledge and experience in Norwegian and international business development with a focus on high-tech start-ups. This is made concrete by the teaching focusing on:

- Business plan, including idea and product development, marketing plan, sales, financing, business system, strategy, patenting, risk, organization and management.
- Group work and case methodology.
- Innovative problem solving in dynamic and unpredictable environments.
- Practical start-up experience.
- Detailed knowledge of local conditions for business establishment at the foreign destination and in Norway.

Structure of the Program

The Norwegian School of Entrepreneurship program is divided into four parts, and offers students the opportunity to gain first-hand experience of entrepreneurship by working as interns within a high-tech start-up company overseas.

1. Introductory course (ENT4000i or similar)

The introductory course held in Norway, gives the students a theoretic understanding of the elements of a business plan.

2. ENT4200 – Startups in practice – Entrepreneurship



The students spend 10 weeks working in start-up companies four days a week. This course gives the students first-hand experience with entrepreneurship. They take part in the daily life of a start-up company, and learn from and contribute to their entrepreneurial journey. Most companies should have a technological focus. The work placement is non-paid and will give the students an understanding of practical entrepreneurship in practice. In addition, there are 2-4 classes during the 10 week work period with discussions and mentoring on important or challenging issues experienced, and 1-2 individual meetings with a mentor.

3. ENT4190 – Entrepreneurship Theory in an International Context

Beside the work placement, the students follow classes at one of our partner universities. Classes are usually held one day a week. The students have several assignments during the period. This course focuses on theory of how to start and grow a successful, high-potential enterprise, and will address different key challenges facing such a start-up venture.

4. ENT4300 – Entrepreneurship and internationalisation

The students attend a seminar during the spring and work with a reflection report during the internships. The seminar includes sessions for inspiration and support for maximising the learning outcomes from the rest of the programme, both academically and personally. Sessions typically include cross-cultural understanding and communication, entrepreneurs sharing their stories and destination briefings held by former students.

Student selection and covering the fees

Participation in the Gründerskolen program requires students to possess at least a Bachelor's Degree, subject to a rigorous selection process in Norway. While the program is inclusive across academic disciplines, its core thrust revolves around high-tech start-ups, often culminating in work placements within IT, biotech, or other technology-oriented companies. It's worth noting that while the program's focus is on start-ups, a technical background isn't mandatory for participating students.

Expenses associated with the Gründerskolen program vary annually and hinge on the chosen destination. Students who qualify for assistance from Lånekassen are eligible for financial support during their overseas stint. Participants of the Entrepreneur School can have their tuition fees completely covered, alongside receiving basic support for a two-month foreign stay and travel-related assistance. It's pertinent to acknowledge that the support provided by Lånekassen isn't adequate to cover both lodging and sustenance costs. Therefore, students must have personal savings earmarked for housing expenditures. Furthermore, the support for the Entrepreneur School is contingent upon the duration of the overseas stay and doesn't automatically extend to support for the subsequent spring semester.



Figure 7. A photo during some training session of the Gründerskolen program

Good Practice 2. [Norinnova](#) :

Norinnova is one of Northern Norway's most experienced competence communities in the field of research commercialization. We connect researchers, startup communities, companies, and commercial operators to develop and utilize the power of innovation in the region. This helps us to create growth by providing new technologies to companies in order to increase their competitiveness.

Norinnova is a group of 20 people with very complex expertise in the commercialization of research and innovation projects. Together, we take care of the entire food chain from start-up to launch to ensure that your idea can make a difference. For nearly 30 years, we have been working closely with the research communities in Northern Norway to develop products and services that have made it noted internationally. By developing new and innovative workplaces, we help create exciting synergies between research and business locally and internationally.

Norinnova offers a range of acceleration and incubation programs for ideas originating from academic institutes. These programs follow a four-step selection and implementation process. The four steps are as follows:

Idea Presentation Phase:

During this initial stage, the owners of the ideas present their concepts to Norinnova, providing insights into the strengths and weaknesses of their proposals. Moreover, they outline the specific areas in which they require assistance and support. This phase serves as a foundational



step in the process of engaging with Norinnova's expertise and resources to further develop and refine their innovative ideas.

Idea Assessment Phase:

Following the presentation of the idea by the innovators, Norinnova initiates a comprehensive assessment process. This process involves a meticulous evaluation of key factors such as uniqueness, essential prerequisites, market viability, potential competitors, and commercial prospects. If the presented idea aligns with these criteria and demonstrates substantial potential in these aspects, it progresses to the subsequent project phase. This diligent evaluation aims to ensure that the selected ideas have the necessary qualities to thrive and succeed in the entrepreneurial landscape.

Project Phase:

Once an idea successfully passes the assessment stage, Norinnova enters the dynamic Project Phase, marked by the creation of a comprehensive project plan and the initiation of strategic actions aimed at realizing the idea's full potential in the market. This phase encompasses a range of essential activities that collectively contribute to transforming the concept into a tangible reality. These actions include:

1. **Strategic Project Planning:** Norinnova collaborates closely with the idea's originators to formulate a strategic project plan. This plan outlines the roadmap for all subsequent actions, setting clear goals, timelines, and milestones to guide the project's progression.
2. **Intellectual Property Management:** When relevant, Norinnova provides expertise in managing intellectual property rights, which may involve processes such as patenting or trademark registration. This safeguarding of intellectual property ensures that the idea remains protected and can be effectively monetized in the market.
3. **Research and Development (R&D):** Depending on the nature of the idea, Norinnova may facilitate R&D activities to further refine and develop the concept. These activities aim to enhance the idea's feasibility, functionality, and potential market impact.
4. **Funding Facilitation:** Norinnova assists in identifying potential funding sources and opportunities, helping innovators secure the financial support required to advance the project. This may involve accessing grants, investment, or other funding mechanisms.
5. **Prototype Creation:** For ideas that involve physical products or technologies, Norinnova aids in the creation of prototypes. Prototyping allows for testing, validation, and refinement of the concept, ensuring that it aligns with market expectations and requirements.
6. **Partnership Identification:** Norinnova actively seeks out and establishes partnerships with relevant stakeholders, collaborators, or potential customers. Partnerships can bring in valuable expertise, resources, and market access to accelerate the project's progress.

Throughout the Project Phase, Norinnova acts as a strategic partner, guiding and supporting innovators as they navigate the intricacies of turning an idea into a successful venture. The ultimate goal is to bring the idea to the market in a manner that maximizes its potential impact and value while ensuring a smooth transition from concept to commercial reality.

**Commercialization Phase:**

The Commercialization Phase marks the culmination of a transformative journey, where the idea that was once a concept evolves into a tangible product or service poised for market entry. This phase is characterized by the execution of strategic actions that propel the idea's transition from development to market launch. Norinnova's role during this critical phase is to guide innovators through the pivotal steps required to successfully introduce their innovation to the intended audience.

Norinnova's programs

Norinnova has four acceleration and support programs. The following is a summary of these four programs.

Student IX: Student IX stands as a dynamic and cost-free incubator designed exclusively for students situated in Northern Norway. The incubator serves as a nurturing hub, catering to both budding entrepreneurs eager to embark on their business journey and those who have already laid the groundwork for their enterprises. Norinnova assumes the role of a unifying force, fostering a vibrant community of young visionaries across the northern region, irrespective of their affiliations with various universities and colleges.

Central to the incubation program is the provision of guidance during the inception stages of ideas. At Student IX, the emphasis is on the spirit of innovation, and ideas need not be fully formed before engaging with Norinnova. The platform extends invaluable guidance through the early stages of ideation, facilitating the crystallisation of concepts into viable business propositions.

To equip these ambitious young minds with the knowledge and skills essential for their entrepreneurial pursuits, Norinnova orchestrates a series of pertinent courses. These courses span various dimensions of business development, including crafting a robust business plan, securing financing, and comprehending the intricacies of customer dynamics. The educational offerings empower students to either initiate their entrepreneurial journey or further propel the momentum of their fledgling startups.

In addition to educational resources, Student IX presents a practical solution by providing dedicated office spaces. This strategic resource allocation underscores Norinnova's commitment to fostering an environment conducive to innovation and growth. By offering a physical space where ideas can flourish, students are enabled to collaborate, iterate, and refine their concepts with the support of like-minded peers and mentors.

Student IX redefines the academic landscape by ushering in a paradigm shift that acknowledges and supports the aspirations of enterprising students. Norinnova's commitment to nurturing these young talents ensures that the entrepreneurial spirit of Northern Norway thrives, enriching the region's economic and social fabric.



Startup IX: Startup IX (Fig. 8) is a golden ticket for entrepreneurs. Entrepreneurs who have a great business idea, can use this program as the first step of their journey. Startup IX gives entrepreneurs and startups access to resources and valuable networks that can be crucial tools on the road to the big breakthrough. The program offers advice on the path to success regardless of which stage the startup is in. Norinnova helps in fundraising and money chasing. This helps gaining the resources required to grow startups. Norinnova guides startups through grant programs and how to attract the right investors. Moreover Norinnova helps build connections to national or even international competence communities to ensure that startups are primed for growth.

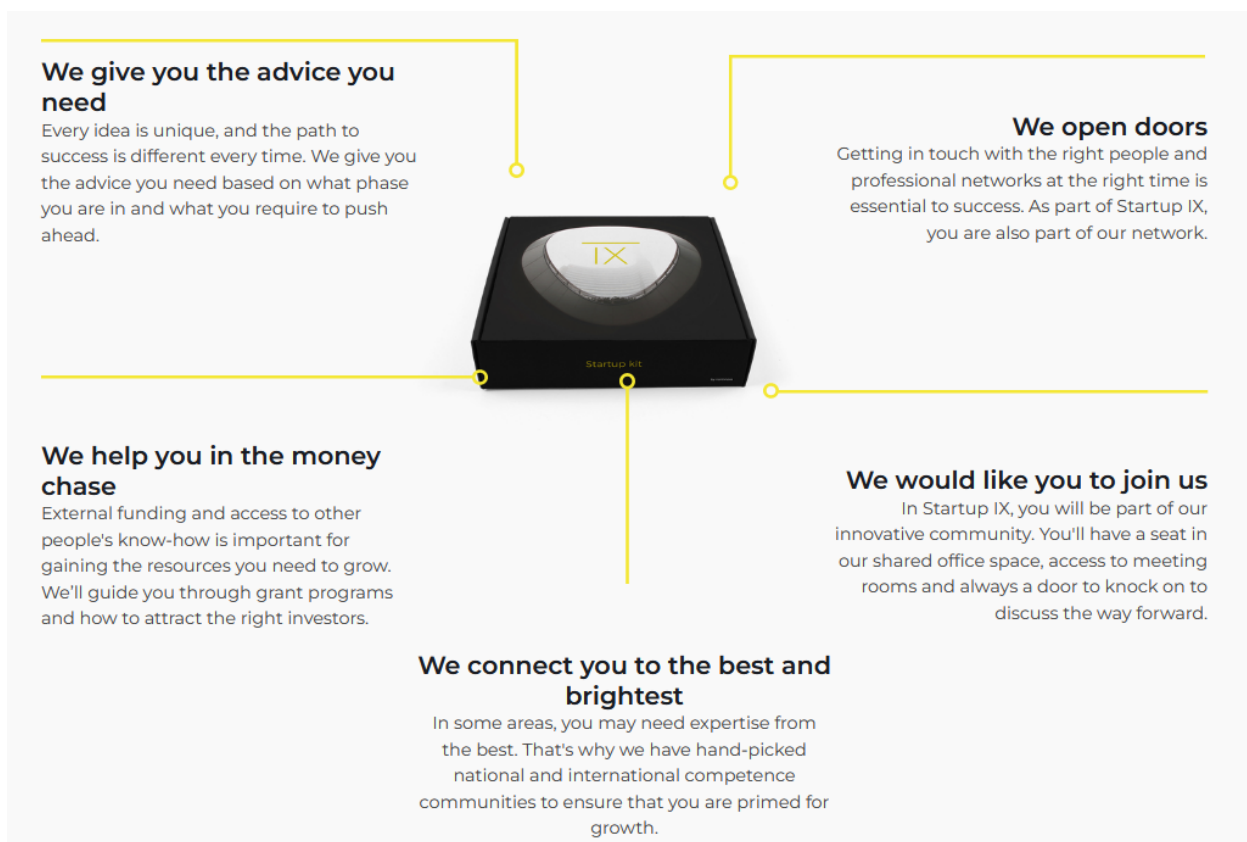


Figure 8. Shows the structure of the startup IX program taken by the Norinnova



Scaleup IX: is an indigenous-driven expansion initiative, stands resolutely as a program meticulously crafted and steered by Norinnova. Its focal point rests on nurturing the ambitions of fledgling startups nestled in the heart of Northern Norway. Eagerly embracing its third cohort of enterprising participants, Scaleup IX embarks on its mission to bestow companies with amplified growth potential, propelling them to new echelons both domestically and globally.

Just as Startup IX serves as an undeniable gateway for entrepreneurs, Scaleup IX emerges as a beacon of opportunity for early-stage startups to ignite their journey. By becoming part of this program, entrepreneurs gain access to a reservoir of resources and invaluable networks—a pivotal arsenal that can determine their monumental strides on the path to game-changing accomplishments. This bespoke program operates with a focus on networking, insights, personal growth, and knowledge enhancement, thereby fostering the ideal ecosystem for startups to flourish.

The value proposition of Scaleup IX is multi-dimensional:

- Seamless access to investors.
- Personalized mentorship courtesy of Olympiatoppen, spotlighting performance and goal attainment.
- Individualized guidance from a dedicated business developer attuned to the company's evolution and requisites.
- Expertise spanning diverse sectors.
- Robust business development tools.
- Networks primed for national and international expansion.
- An all-encompassing comprehension of entrepreneurs as 24/7 human entities.

Much like its Startup IX counterpart, Norinnova once again takes on the mantle of aiding in fundraising endeavors — a pivotal aspect for fueling growth. Scaleup IX's expertise extends to shepherding startups through grant programs and the nuances of attracting the right investors. Moreover, it constructs bridges to national and international proficiency hubs, ensuring startups are not only prepared but poised for exponential advancement.

The FutureSea Accelerator (the fourth program): stands as a convergence-centred initiative, beckoning forth growth companies and spin-offs emerging from established enterprises. Its overarching mission lies in nurturing novel sea-based ideas that exude innovation.

Operating through a consolidation-oriented framework, this program actively nurtures the expansion of participating companies within the market landscape. FutureSea's unique value proposition resides in affording these companies an unparalleled opportunity—a gateway to access pertinent resources and influential figures that propel them with an extra surge of momentum.

The focus of FutureSea is firmly anchored in seeking out pioneering companies with the potential for growth and a global outlook. It seeks entrants from ocean-related sectors such as automation, IoT, sensors, and high-value marine raw material-derived products.



The Program Essence

At its core, the program champions the significance of networking interactions, the exchange of expertise, and pragmatic guidance. By weaving in funding partners, industry collaborators, academic affiliates, and mentors, FutureSea crafts an enriching environment for mentorship, networking, feedback, lectures, and workshops.

The program's core attributes entail:

- A selection of six start-up companies and novel innovative business concepts stemming from established enterprises, all underscored by growth ambitions and potential. These entities share a common thread—the ocean—while hailing from various corners of the nation.
- A structured, year-long collection-based approach comprising six physical gatherings. These gatherings will convene in Tromsø, Oslo, and an overseas locale.
- Amidst the thematic meetups featuring compelling presenters and domain experts, the inter-gathering periods are marked by advisor follow-ups, mentorship, and personalized coaching. The program is not solely dedicated to bolstering business ideas; it equally invests in fortifying teams, rendering them primed for growth. This journey leverages Norinnova's extensive national and international network to cater to each company's distinct needs.

Underpinning Criteria

Start-ups admitted to the program must assure funding for a minimum of 12 operational months. Their strategies should align with one or more of the United Nations' sustainability goals. The companies must be registered within Norway and must pass through a rigorous application and selection process to qualify for the program.

Good Practice 3. [the Norwegian Innovation Clusters](#):

The Norwegian Innovation Clusters program represents a collaborative endeavour overseen by Innovation Norway, SIVA, and the Research Council. This collective ownership is managed in representation of the Ministry of Trade, Industry and Fisheries, as well as the Ministry of Local Government and Regional Development. Operating under this comprehensive framework, the program boasts an impressive portfolio of over 30 distinct clusters, each encompassing a diverse spectrum of specialised expertise.

These innovation clusters form the bedrock of a strategic initiative aimed at fostering collaboration, knowledge exchange, and synergistic growth across various sectors. By bringing together academia, industry, and research institutions, the program harnesses the power of collective intelligence to drive innovation, enhance competitiveness, and fuel economic development on both regional and national scales.



Each cluster is tailored to address specific industry niches, catalyzing cross-disciplinary partnerships that amplify the impact of research, spur technological advancements, and accelerate the translation of ideas into tangible market solutions. This interconnected network of innovation clusters serves as a testament to Norway's commitment to nurturing a vibrant ecosystem where collaboration thrives, propelling the nation's position as a hub of cutting-edge innovation and sustainable growth.

In the subsequent lines, we will provide a succinct overview of the objectives of some of these clusters. This will offer readers a comprehensive glimpse into the scope and impactful initiatives undertaken by the Norwegian Innovation Clusters. We will focus on clusters related to technical-based subjects.

Industry Cluster for Applied Artificial Intelligence

The Industry Cluster for Applied Artificial Intelligence is poised to play a pivotal role in propelling Norway into a prominent position in the realm of profitable and sustainable artificial intelligence (AI) applications within the business landscape.

Given the swift evolution of digital technologies, numerous entities from both the public and private sectors are either contemplating or have already embarked on the utilization of AI to enhance operations, optimize efficiency, and foster the development of products and services.

The dynamic landscape of new technologies and business innovations continuously unveils fresh avenues for AI implementation. The cluster serves as a dynamic hub to seize these emerging opportunities. Noteworthy reports and strategic frameworks, including Digital21 and the government's AI strategy, underscore the significance of harnessing the potential of AI for competitive advantages, underscoring its role in shaping future innovation and competitiveness across organizations.

Cluster of Energy Transition Norway

Energy Transition Norway (ETN), formerly known as Norwegian Energy Solutions, stands as a prominent energy transition cluster rooted in Stavanger, widely recognized as Norway's energy epicentre. The overarching goal of the cluster revolves around uniting world-renowned expertise and cutting-edge technological landscapes to accelerate innovation within the energy transition domain.

With an extensive roster comprising over 130 members and partners, Energy Transition Norway encompasses a diverse spectrum of entities. This ranges from operators, suppliers, and start-ups to investors, research institutions, academic bodies, and governmental authorities. This comprehensive membership base spans the entirety of the oil and gas value chain, thus endowing the cluster with a distinctive edge. By facilitating the transformation of companies into thriving entities within emerging value chains, the cluster nurtures an environment of innovation and technological advancement. Collaborative endeavours spanning various sectors and member firms cultivate the ideal milieu for pioneering technological developments.



At its heart, Energy Transition Norway serves as a pivotal arena for networking, knowledge dissemination, and cooperative initiatives. The platform empowers members to delve into discussions surrounding challenges and solutions that extend beyond the confines of their conventional networks. This approach fosters cross-pollination of ideas and perspectives, promoting an ecosystem that thrives on shared wisdom and collaborative synergy.

Energy Valley cluster

Energy Valley operates as a dynamic, industry-driven technology cluster and holds the distinguished title of being recognized as the Norwegian Center of Expertise (NCE) in energy technology by Innovation Norway. The sphere of influence extends nationwide, with a concentration of esteemed cluster members situated in key locations across the capital region, encompassing locales such as Notodden, Kongsberg, Asker, Bærum, Oslo, and Halden.

At the core of Energy Valley's mandate lie several impactful industrial development and innovation projects, all while actively engaging in export endeavors through strategic partnerships as part of Team Norway and direct collaborations with the Ministry of Foreign Affairs. This concerted effort positions the cluster as proactive contributors to bolstering Norway's global energy presence and influence.

With a resolute commitment to nurturing innovation and entrepreneurial spirit, Energy Valley assumes a significant role as the principal stakeholder of Energy Invented, a burgeoning incubator. Notably, Energy Invented has recently undergone a transformation into a private limited company (AS) and has expressed intentions to join SIVA's esteemed incubator program. Furthermore, as a testament to global engagement, Energy Valley proudly stands as the representative for Norway and a dedicated member committee within the esteemed World Energy Council, reinforcing commitment to shaping the international energy landscape.

ACT Arctic Cluster Team

ACT stands as a driving force propelling Norway's sustainable transition. With a focus on heightened innovation capacity and industry competitiveness, ACT plays a pivotal role in ensuring Norway's alignment with the Paris Agreement.

The partnership forms a collective of enterprises spanning diverse areas of expertise, representing different segments within the process industry value chain. A prominent industrial hub, this cluster encompasses leading companies with extensive experience in national and international competition, significantly impacting regional employment and value creation.

As part of the national program "Norwegian Innovation Clusters," Arctic Cluster Team is a key participant, collaborating closely with Innovation Norway, Siva (The Industrial Development Corporation of Norway), and the Norwegian Research Council. The cluster's prominence is bolstered by the support it receives from entities such as Prosess21, Innovation Norway Nordland, Nordland County Council, North Norway European Office, LO, NHO, NCE Eyde, NCE iKuben, Industrial Green Tech, Concrete Innovation Cluster N3C, Ocean Cluster Helgeland, and VIA – Vital Infrastruktur Arena.



Guiding ACT's aspirations is a dynamic steering group comprising 6-8 members, alongside two deputy representatives, selected annually by the partnership. This leadership team, chosen from diverse backgrounds, ensures a comprehensive representation of industries and geographic areas. With a minimum of six private company representatives, the group brings a private-sector perspective to the table, spanning manufacturers, research entities, suppliers, entrepreneurs, and investors. Drawing from extensive experience in business, research, and cluster development, this group contributes a wealth of expertise and networks.

Overseeing the operational aspects of the cluster is Kunnskapsparken Helgeland (KPH), an innovation-driven entity fostering sustainability, value creation, and growth in Helgeland. As a vital part of SIVA's national innovation and business development infrastructure, KPH leverages a robust network, solid industrial ownership, and a track record of impactful results, poised to drive ACT's transformative journey.

In a sector ripe for greenhouse gas reductions, collaboration with institutions like SINTEF, NTNU, and UiT plays a crucial role. This partnership elevates the innovation landscape, aiming to develop novel solutions for CO2 capture, circular economy practices, and smart production. The fervent commitment and ownership demonstrated by core companies are pivotal factors for success, exemplifying collective dedication to sustainable evolution.

Good Practice 4. [International Development Norway:](#)

The International Development Norway (IDN) is a spin-off of SINTEF, the largest contract research institute in Scandinavia. IDN has so far reached 28 countries in four continents, with the work from more than 50 connected universities, Norwegian authorities, bilateral and multilateral agencies, international institutions, governmental organisations, local businesses and other institutional partners. Since 2010, they have also participated in more than 20 EEA Grants projects.

An important component of all their projects is matchmaking between Norwegian companies and local partners to connect and accelerate international opportunities. They believe that learning by doing is the most efficient way towards further development, and therefore contribute to both partners and projects in every stage – from design and development through realisation to accomplishment.

The International Development Norway (IDN) undertakes a diverse array of initiatives, encompassing not only the provision of assistance to Norwegian startups for enhanced global exposure but also extending support to nascent entrepreneur ecosystems on a global scale. The subsequent section delves into a selection of these projects, with specific attention directed towards educational undertakings and initiatives geared towards fostering the expansion of startups and small to medium enterprises (SMEs).

Creating non-formal education products and applications - Project dedicated to non-formal education services in form of IT-based and AI-based educational tools



BACKGROUND

The main activity of the participating company JSC “Nacionalinis švietimo centras” is to provide IT solutions for the educational sector. While developing new informational systems, the company always cooperates with educational authorities and administering agencies. The main goal is to provide the best IT solutions in education and to offer new and unique products to educational institutions. NSC have a huge experience by participating in EU funding with research and the development of educational IT innovations programs.

COOPERATION

The cooperation in this project will take place between NSC, Vytautas Magnus University and International Development Norway. The idea is to create an innovative platform ensuring an effective relationship between providers and users of non-formal education services. The project is based on:

- Artificial Intelligence
- Analysis of Lithuanian non-formal education service providers
- Constant non-formal education market analysis

Both NSC and International Development Norway see the project as a strategic opportunity to develop joint business activities in Lithuania, Norway and other countries. Different partner models are considered and options with other partners in Norway were identified and onboarded. The project could help to strengthen service quality of the communities of non-formal education services in Lithuania and Eastern Europe. This includes sharing their experience in non-formal education topics, quality and community service.

Green innovation and digital capacity building with small Greek businesses

“Sustainable business futures” aims to address the digital skills and green innovation expertise gap that many small and medium-sized enterprises (SMEs) in Greece face. These skills are necessary to succeed in the 21st century. Empowered by obtaining them, SMEs participating in the project could become more competitive and sustainable, contributing to the development and growth of the Greek economy.

International Development Norway project partners, through their expertise identified topics necessary to cover in digitalization workshops and trainings to stay competitive within the globalized and digitalized market. They include Website Development, Social Media Marketing and E-commerce. This experience will also provide a Networking opportunity for the local SMEs.

Green Industry Innovation coaching and mentoring will support businesses in becoming more sustainable and in building their innovation capacity and resilience. Topics covered include Sustainable supply chain management, Circular economy for small businesses, Renewable Energy & efficiency, Sustainable Communication & Branding, as well as Life Cycle assessment.



The project is also expected to result in enhanced collaboration between partnering countries, adding to knowledge and expertise sharing.

Measures

- Train-the-trainer workshops in Greece, identifying the Trainers
- Training and Workshops for Project Partners in Norway
- 5 Green Innovation workshops for SMEs
- 5 ICT (Information and Communication Technologies) workshops for SMEs

International Development Norway Involvement

IDN is responsible for the organization of the Project Partners' visit to Norway with workshops on Sustainability training for SMEs and workshops for the training program design. IDN leads the selection and adaptation of existing training materials to local needs. Two consultants from IDN will visit Greece to deliver training materials and carry out Train-the-Trainer Program whose goal is to identify trainers, develop training programs for them and provide feedback and support.

These two examples exemplify the impactful role of International Development Norway as a catalyst for change, both at the national and international levels. The organization is dedicated to reshaping the entrepreneurial landscape by leveraging education, training, and stakeholder connections as potent instruments of transformation.

Good Practice 5. [the Norway Innovation network:](#)

Situated in Oslo, Norway, the Norway Innovation Network (NiN) stands as a distinguished research organization with a robust presence in the fields of Environment & Climate Change and Education. Drawing upon a wealth of experience amassed over five years, NiN actively engages in the conception, execution, and evaluation of projects on both European and national scales. These initiatives span a diverse spectrum of thematic areas, encompassing critical subjects such as ICT & Digital Transformation, Climate Change (catalyzing green transitions and advancing energy growth), Entrepreneurship, and Social Inclusion. Demonstrating adeptness in formulating effective strategies for dissemination, communication, and exploitation, they employ a range of tools to facilitate these endeavors.

The NiN has taken proactive measures to equip individuals with the skills, competences, and qualifications necessary to navigate an evolving socio-economic landscape. One of their notable initiatives in this pursuit is the YISEM project.

Challenges addressed by YISEM

The YISEM project, making a synergy with the SEEDplus project, addresses a range of challenges that warrant closer examination. In the current landscape, young individuals confront an array of hurdles across personal and professional domains. These include the



reverberations of economic downturns, the prevalence of transitory employment structures, and the profound reverberations stemming from the recent pandemic. Of particular concern is the disproportionate impact of these factors on the youth, exacerbating pre-existing inequalities within society.

The multifaceted nature of these challenges extends beyond immediate circumstances. Financial constraints, limited exposure to practical experiences, skill deficiencies, and a lack of familiarity with funding avenues collectively erect formidable barriers. Consequently, young individuals exhibit lesser inclination toward venturing into self-employment pursuits when compared to their more experienced counterparts. The pivotal question, then, revolves around the provision of targeted support mechanisms capable of addressing these challenges and fostering an environment conducive to novel and innovative approaches. By doing so, the latent potential of the youth demographic can be harnessed in a constructive manner, propelling them towards meaningful contributions within various domains.

Central to the YISEM project is its focus on digital entrepreneurship, aiming to forge a community of empowered young individuals who can collectively shape a more inclusive and promising world for themselves and future generations. Beyond facilitating the establishment of personal enterprises, entrepreneurial skills encompass a broader significance—encouraging the pursuit of inventive solutions, recognition of opportunities, and fostering the propensity for calculated risk-taking.

These skills bear relevance across multiple spheres of life, ranging from active civic engagement through local initiatives to diverse vocational pathways. In a post-pandemic world, the ability to adapt and nurture innovative ideas has assumed greater importance for young individuals embarking on their professional journeys.

Concurrently, the YISEM project endeavors to introduce comprehensive practices encompassing media literacy training, digitalization, entrepreneurship, and community engagement. In doing so, YISEM addresses the imperative of inclusively engaging young individuals from diverse backgrounds in collaborative undertakings.

Within the YISEM framework, partners collaboratively share exemplary methodologies and identify resources aimed at cultivating a youth-oriented entrepreneurial mindset. This extends to fostering a nuanced understanding of the dynamic interplay between the economy, human interactions, and cultural landscapes. Designed with a focus on youth educators, voluntary organizations, youth centers, and vocational training institutions—entities directly engaging with the target groups—envisioned tools empower practitioners to more effectively involve young individuals in self-initiated ventures. These tools encompass innovative digital formats, serving to enhance outreach and interaction with young audiences. Drawing upon established European-level knowledge and best practices, project partners amalgamate this expertise with context-specific insights crucial for the successful execution of social entrepreneurship initiatives.

YISEM's Primary Objectives:



- Cultivate digital entrepreneurship skills and foster community involvement among young individuals.
- Facilitate quality employment prospects and promote the exchange of best practices.
- Provide easily accessible educational resources for youth workers, supporting young individuals in their pursuit of self-directed projects.
- Develop non-formal educational tools in podcast format, coupled with experiential and peer-led learning opportunities such as international training and localized innovator hubs.
- Enhance the capabilities of youth work organizations in the domains of social entrepreneurship and digital media, while fostering inclusivity for young individuals with limited opportunities.
- Elevate awareness among local and European stakeholders, emphasizing the inherent value of inclusion, diversity, and the transformative potential of youth participation in propelling social innovation.
- Forge pathways for innovative careers and non-formal educational avenues through a cross-sectoral approach.

Summary of best practices in the field of entrepreneurship in Norwegian universities.

From the described practices, the following generalisations can be made:

An ecosystem provides full-scale support to startups and entrepreneurs, with universities being an essential part of it.

- A well-grounded entrepreneurship program is available
- Experienced accelerators and incubators with a long professional history provide a wide range of medium-term support programs
- Ecosystem players join forces and a lot of activities are developed within clusters
- Special attention is paid to startups international development
- The main supported areas include digital entrepreneurship, renewable energy, environment and climate change, sharing economy.

Students' competences

The students' competence survey in Norway received a total of 14 responses. 57.1% of the respondents are male and 42.9% are female (Fig. 9). The survey was answered by 28.6% of PhD students, 28.6% of master's students, and 42.9% of bachelor's students (Fig. 10). 78.6% of respondents represent Physical and Engineering Sciences, 14.3% are Social Sciences and Humanity and 26% are studying Life Sciences (Fig. 11).



1. Please, select you current status

14 responses

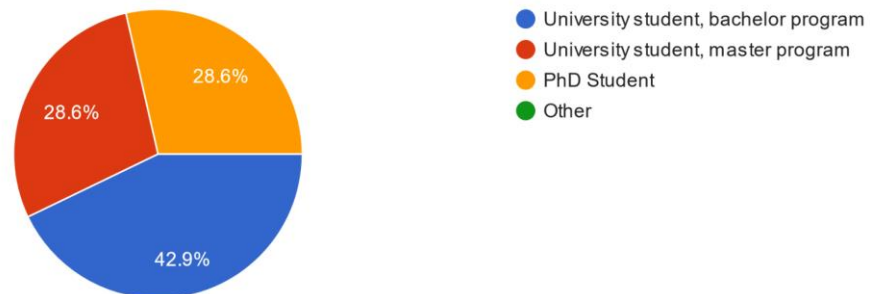


Figure 9. Distribution of the UiT's students sample based on the level of the study

4. Please, select your gender

14 responses

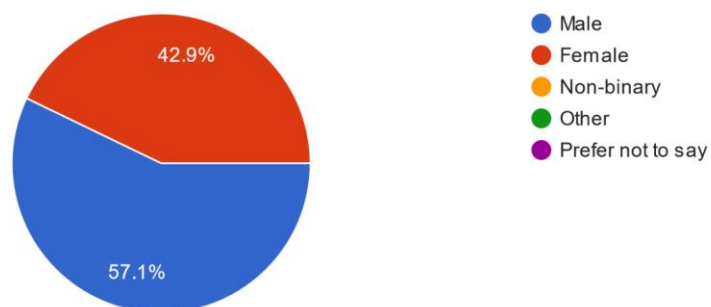


Figure 10. Gender distribution of the UiT's students sample



2. What is your specialty (major)?

14 responses



Figure 11. Distribution of the UiT's students sample based on the subject of the study

Figure 12 shows the motivation of the students, studying at technical specialties. 93% of respondents are passionate about their professional field. 50% of the students consider that the tech professional field will be the most important over the next 10 years and that this field is most related to the sustainable development goals. 29% of students are aimed at high salaries in the tech specialties labour market and believe that there is a good working opportunity in this field associated with travel. The least important motivational factors were friends' preferences (7%), and parents' opinion (7%).

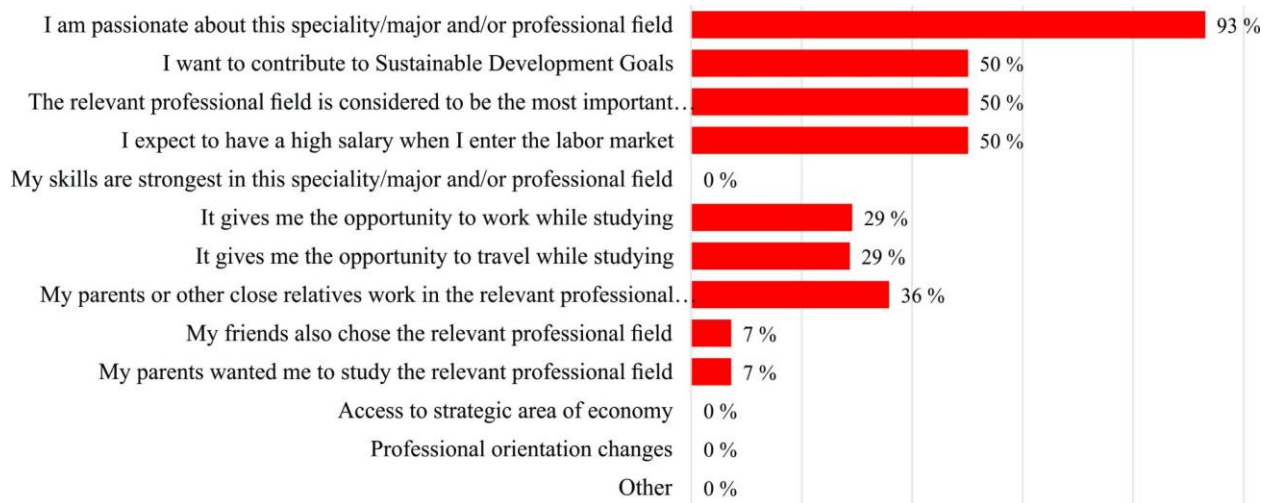


Figure 12. Motivation for students to study tech specialties in Tromsø

A significant majority of survey participants, amounting to 86%, concurred on the importance of honing entrepreneurial skills. When probed further on which specific entrepreneurial competencies they deem essential, the respondents reflected on the entire spectrum of entrepreneurial skills as outlined in the EntreComp framework.

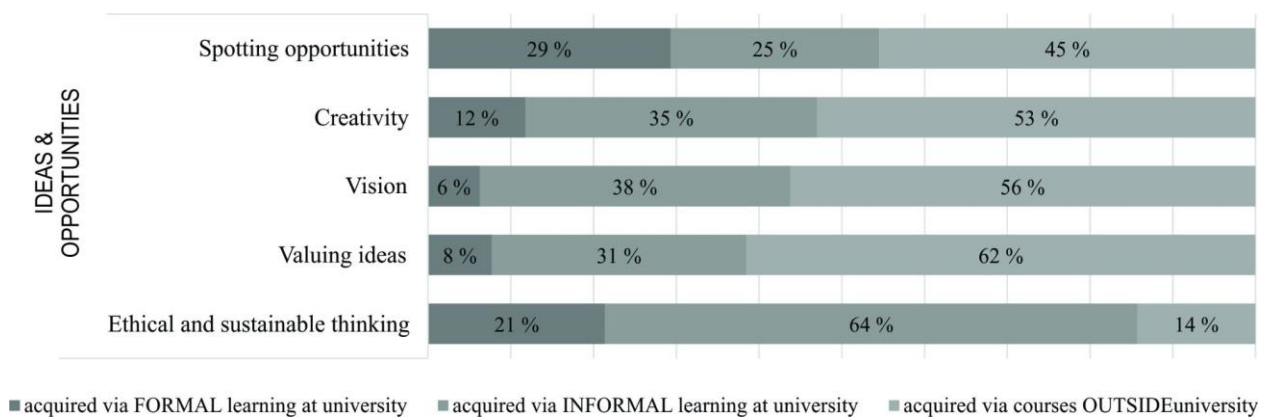
The data revealed a strong inclination towards certain skills, heralding them as most valuable in their entrepreneurial pursuits. Among these, creativity topped the list with a unanimous consensus, receiving a full 100% affirmation from the respondents. Following closely were motivation and perseverance, vision, ethical and sustainable thinking, as well as learning through experience, each garnering a commendable 98% approval rate. These skills are seen as the cornerstone in navigating the complex and demanding terrain of entrepreneurship.

Other entrepreneurial capabilities that also received substantial acknowledgment include valuing ideas, financial and economic literacy, spotting opportunities, planning and management, and teamwork, each being deemed important by 96% of the respondents. These skills were recognized for their critical role in fostering a well-rounded entrepreneurial mindset and facilitating effective action in the real-world business landscape.

The response to the "INTO ACTION" segment, which likely encapsulates a practical application of entrepreneurial skills, also bore witness to a high regard from the survey participants. The chart depicted in Figure 13 seemingly elucidates a strong inclination of respondents towards appreciating and acknowledging the gravity of applying these skills in actionable entrepreneurial ventures. This recognition underscores a well-informed understanding among the surveyed individuals about the indispensable nature of these competencies in the entrepreneurial domain.



Figure 13. The importance of entrepreneurial competencies for UiT's students



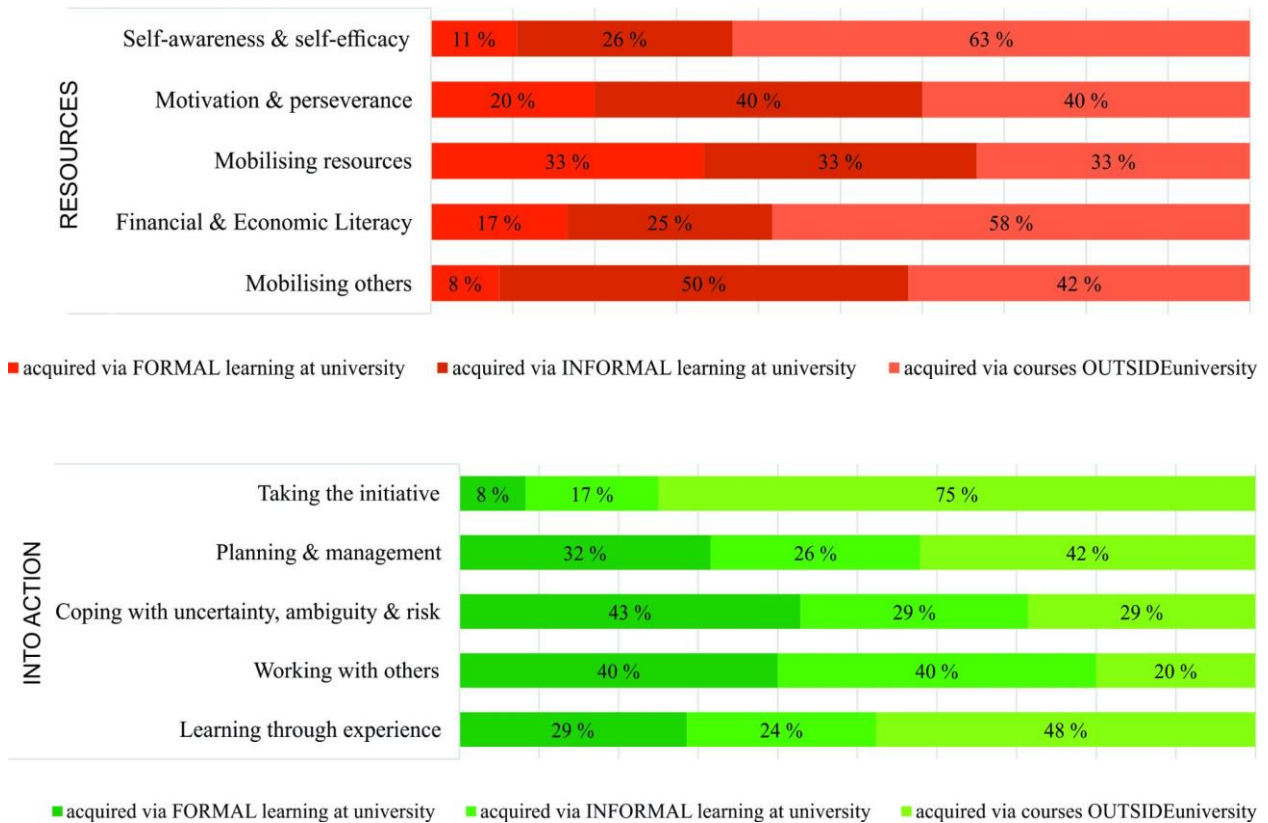


Figure 14. Entrepreneurship competencies and ways they are acquired by students at UiT

Figure 14 elucidates the avenues through which students acquire entrepreneurial competencies. Predominantly, the university environment emerges as a focal point for the development of these competencies, with a significant percentage ranging up to 86% of students honing their entrepreneurial skills within this academic setting. Delving deeper into the modalities of learning, it is discerned that formal learning experiences contribute substantially, evidenced by a rise from 6% to 43% of students leveraging this mode for skill acquisition. Furthermore, an appreciable segment of students, ranging from 17% to 64%, benefit from informal learning engagements through activities that support entrepreneurship endeavors.

Moreover, the graph highlights an alternative yet substantial pathway for skill acquisition outside the university realm. A striking 14% to 75% of students seize opportunities beyond the academic borders to cultivate their entrepreneurship competencies.

The diagram delineates that Higher Education Institutions (HEIs) through formal learning channels are instrumental in nurturing competencies in certain critical areas. For instance, a noteworthy 43% of students bolster their ability to navigate through uncertainty, ambiguity, and risk, followed by 40% enhancing their collaborative capabilities in working with others. Other significant competencies developed include mobilising resources (33%), planning and management (32%), along with learning through experience and spotting opportunities each at 29%.



On the flip side, informal education within HEIs plays a pivotal role in molding competencies in ethical and sustainable thinking (64%), mobilizing others (50%), and equally contributing to the honing of motivation and perseverance and working with others, each at 40%.

Outside the university's ambit, the acquisition of entrepreneurial skills continues robustly. A remarkable 75% of students exhibit initiative-taking, while self-awareness and self-efficacy are enhanced in 63% of students. Other crucial skills garnered include valuing ideas (62%), financial and economic literacy (58%), vision formulation (56%), and creativity (53%).

The comprehensive analysis as depicted in Figure 14 illuminates the multifaceted pathways and environments conducive for fostering entrepreneurial competencies among students. Whether within the structured confines of formal education, the dynamic and interactive realm of informal education in HEIs, or the expansive, real-world engagements beyond the university, students are evidently harnessing a rich array of entrepreneurial skills essential for navigating the complex and evolving entrepreneurial landscape.

The data illuminates (Fig. 15) a preference hierarchy among students regarding the mediums employed for enhancing their entrepreneurial acumen. At the zenith of this hierarchy lies the traditional yet robust method of reading books or articles, which captivated the interest of 67% of the sample population. This medium, revered for its ability to provide in-depth insight and a structured understanding, stands as the most favored route towards entrepreneurial enlightenment among the surveyed students.

Trailing closely, yet embodying a more modern approach, social media platforms entice 61% of the students. The appeal of social media lies in its dynamic nature, capable of offering real-time insights, diverse perspectives, and a touch of practicality as it often brings entrepreneurial narratives from across the globe directly to the fingertips of the students. It facilitates not just passive absorption of knowledge but also interactive learning through discussions, debates, and real-time feedback.

Venturing into a more structured digital learning realm, 37% of students harness the potential of Massive Open Online Course (MOOC) platforms such as Coursera and EdX. These platforms amalgamate the structured learning trajectory akin to traditional learning with the flexibility and diverse course offerings synonymous with online education. The relatively significant percentage of students leveraging MOOCs reflects a blend of self-directed learning coupled with a desire for a structured curriculum to augment their entrepreneurial skills.

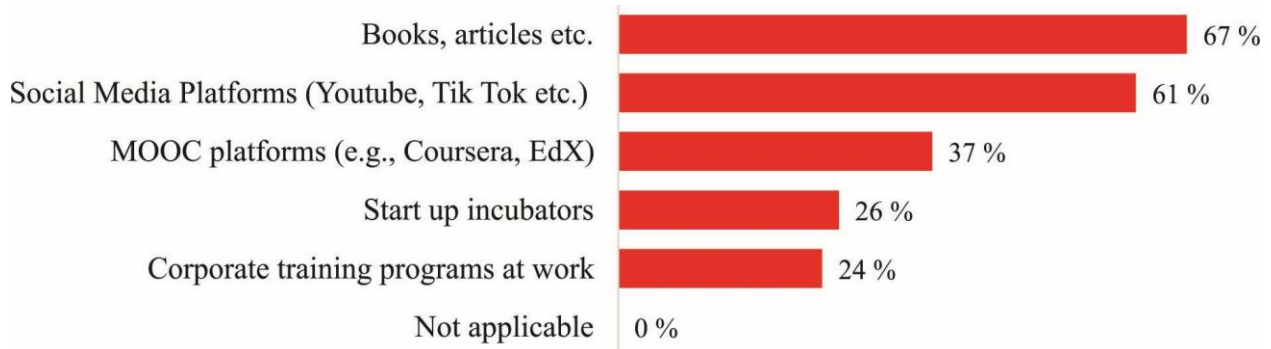


Figure 15. Platforms where UiT's students acquire entrepreneurship competencies

Figure 16 showcases students' entrepreneurial aspirations post-academia. A notable 69.6% aim to pioneer startups, while 39% are drawn towards science and R&D. Another 30.4% envision managing businesses beyond the startup realm. These data points underscore the need for enhanced startup and prototyping infrastructure within Higher Education Institutions (HEIs).

A substantial 34.8% of students eye the corporate sector, showcasing the relevance of entrepreneurial skills in traditional settings. Moreover, 13% and 8.7% of respondents aim to apply their entrepreneurial acumen within the education sector and public activities, respectively, highlighting the versatile application of entrepreneurial competencies across diverse professional fields.

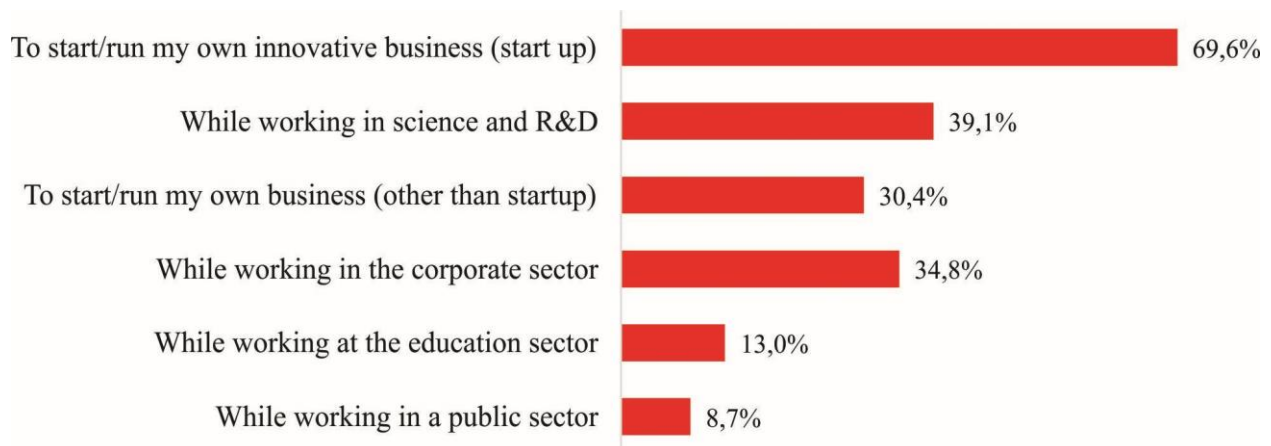


Figure 16. UiT students' intentions to use their entrepreneurial competences.

HEInnovate self-assessment

Presented in Figure 17, the outcomes of the HEInnovate self-assessment provide an insight into the aggregated ratings based on responses from the academic, non-academic staff, and student body of the university. These assessments shed light on various aspects of UiT's entrepreneurial ecosystem and its integration within the academic framework.

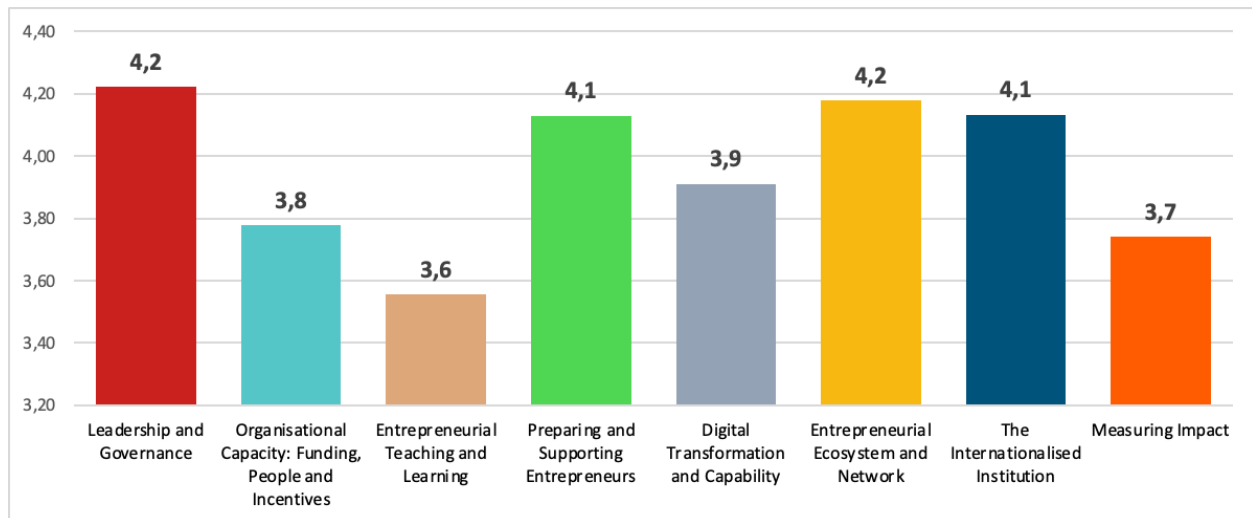


Figure 17. UiT HEInnovate self assessment.

The findings unveil UiT's commendable performance, notably achieving the highest scores of 4.2 in both leadership and governance and the robust entrepreneurial ecosystem and network. Additionally, the university secures a commendable score of 4.1 in preparing and supporting entrepreneurs and maintaining an internationalized institution. However, the self-assessment reflects a comparatively lower score of 3.6 in the domain of entrepreneurial teaching and learning.

While UiT garners high marks across diverse dimensions of the HEI self-assessment, there remains room for advancement. Notably, the entrepreneurial teaching and learning component has been highlighted as an area for potential enhancement. The scores across the entrepreneurship dimensions are as follows:

- Entrepreneurial Teaching and Learning - 3,6
- Preparing and Supporting Entrepreneurs - 4,1
- Entrepreneurial Ecosystem and Networks - 4,2

The details of the entrepreneurship dimensions are provided in Figure 18.

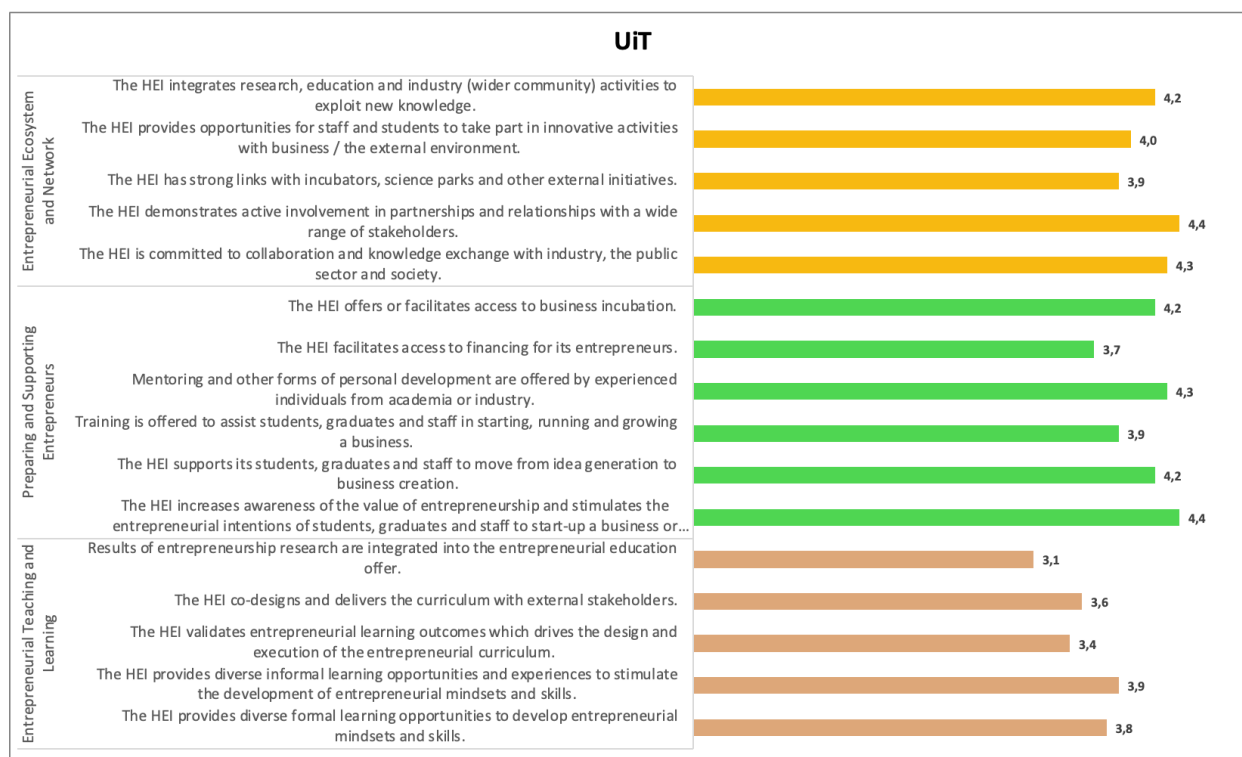


Figure 18. UiT's HEInnovate entrepreneurial dimensions.

UiT The Arctic University of Norway has undergone a comprehensive self-assessment process in various dimensions of entrepreneurial education and support. The results, as shown in figure 10, provide valuable insights into the university's strengths and areas for improvement.

In the realm of Entrepreneurial Teaching and Learning, UiT offers a diverse array of both formal and informal learning opportunities to nurture entrepreneurial mindsets and skills among its students. The formal learning opportunities score 3,8 while the informal learning scores 3,9. The university actively integrates the outcomes of entrepreneurship research into its educational offerings (with score of 3,1), providing students with up-to-date insights and knowledge. However, there is a need to enhance the integration of research outcomes to further enrich the entrepreneurial education experience. The entrepreneurial curriculum has well defined learning outcomes (with score of 3,4) which are aligned with the needs of external stakeholders (with score of 3,5). However the below average score of 3,6 indicates that there is a need for action to increase the quality of entrepreneurial education at UiT.

UiT's commitment to Preparing and Supporting Entrepreneurs is evident in its efforts to increase awareness (with a score of 4,4) about the value of entrepreneurship and stimulate entrepreneurial intentions among its students, graduates, and staff. The university provides comprehensive support, from idea generation to business creation (score of 4,2), including training (score of 3,9) and mentoring (score of 4,3) by experienced individuals from academia and industry. UiT's dedication to facilitating access to financing (score of 3,6) and offering business incubation (score of 4,2) is a noteworthy aspect of its ecosystem. It is worth



mentioning here that the Norinnova (one of the good practices and structures presented in a previous section) is one of the mechanisms used by UiT to support their students and staff.

In terms of Knowledge Exchange and Collaboration, UiT excels in forging collaborations with industry, the public sector, and society (with a score of 4,3). The university actively engages with various stakeholders, forming robust partnerships that contribute to a dynamic and knowledge-sharing environment (with a score of 4,4). However, while the university maintains strong links with external initiatives like incubators and science parks (score of 3.9), there is room for further enhancement in this dimension. Moreover the UiT provides opportunities for staff and students to take part in innovative activities with business / the external environment (score of 4,0) and integrates research, education and industry activities to exploit new knowledge (score of 4,2).

Overall, UiT's HEI self-assessment reveals a proactive approach to nurturing entrepreneurship and promoting collaboration within its ecosystem. The university's strengths lie in its commitment to providing comprehensive support for entrepreneurs, facilitating valuable partnerships, and fostering a culture of knowledge exchange. These results reflect UiT's dedication to innovation and its aspiration to continually improve its entrepreneurial offerings for the benefit of its students, graduates, and the broader community.

Technical University of Varna (TUV)

Regional landscape and good practices

Regional landscape – overview

The educational landscape of entrepreneurship in Bulgaria, particularly at the higher education level, is intricately connected to and often mirrors the structural framework of the country's universities. At present, Bulgaria boasts a total of 51 accredited Higher Education Institutions (HEIs), including private universities and military academies. Among these, there exist several prominent universities that host a diverse array of faculties spanning various scientific and professional domains. Notable examples include:

- Sofia University St. Kliment Ohridski
- University of Veliko Tarnovo
- Russe University
- Plovdiv University
- University “Asen Zlatarov” Bourgas

Contrastingly, the academic landscape also comprises numerous institutions, both large and small, with a more concentrated focus on specific scientific and professional disciplines. These universities, often regionally-oriented, cater to fields such as Medical Sciences, Technical Sciences, Economics, Arts, and even more specialized realms. For instance, within Varna, public universities encompass:



- Technical University of Varna
- Economic University of Varna
- Medical University of Varna
- Naval Academy Varna

However, the presence of universities with narrower specialisations often results in the formulation of bachelor's and master's programs with limited optional and elective inter- and multidisciplinary courses. Consequently, universities centred around technical and engineering sciences tend to produce graduates well-equipped for employment within existing corporations, yet lacking in the cultivation of an entrepreneurial mindset and associated skills. On the contrary, economic universities furnish a broader spectrum of entrepreneurship-related courses and training; however, these institutions often fall short in delivering robust instruction pertaining to innovative technologies beyond the realms of finance and information and communication technology (ICT).

In light of the aforementioned insights, this analysis endeavours to elucidate the methods through which entrepreneurial education is dispensed within universities offering technical bachelor's and master's programs. This examination seeks to portray the current state of affairs. Simultaneously, the study will spotlight exemplary practices primarily found within larger universities and those specialising in economics.

Entrepreneurial training in Technical Universities

This section presents a study on the entrepreneurial training landscape in Bulgarian universities that offer bachelor and master courses in the technical professional field. The scope of the study can be described as:

- The study looks into technical sciences as defined by the Bulgarian qualification framework. Fields included in this framework are presented in table 1.

Table 1. List of professional fields included in the study

Code 5. Technical sciences	
Code	Field
5.1	Machine Engineering
5.2	Electrical engineering, electronics and automation
5.3	Communication and computer technologies
5.4	Power Engineering
5.5	Transportation, Navigation, and Aviation
5.6	Materials and Material Science
5.7	Architecture, Construction, and Geodesy
5.8	Exploration, Extraction, and Processing of Mineral Resources
5.9	Metallurgy
5.10	Chemical Technologies



5.11	Biotechnologies
5.12	Food Technologies
5.13	General Engineering

- For the study Entrepreneurial training is considered for courses that provide students with any knowledge relevant to starting and managing a company such as: management, economics, marketing, finance, business planning, etc.
- The study was made based on the curriculums of bachelor and master courses in the fields according to table x, posted on the official web-sites of Bulgarian universities. Considering this, the analysis does not aim to provide an exhaustive or detailed presentation – as not all universities post their full curricula or as of the publishing of the roadmap some of the information might be dated, but rather give an overview.
- The Bulgarian education system considers three types of courses:
 - Compulsory – a course that the student has to take in order to graduate
 - Elective – a course that allows the student to pick among several options
 - Facultative – a course that the student can take, but it is not required for successful graduation
- The analysis encompasses a total of 17 Bulgarian HEIs and approximately 300 courses across different bachelor and master programs.

Based on this scope the following findings can be stated for the study:

- The distribution of when students usually take entrepreneurship courses during their study in a bachelor program is presented at figure 19. Considering that Bulgarian bachelor programs usually take 8 semesters, it can be seen that there is no strong policy between different universities when entrepreneurship should be taken. Courses are more or less evenly distributed, with peaks in courses taught in the beginning of the program and courses taught at its end.

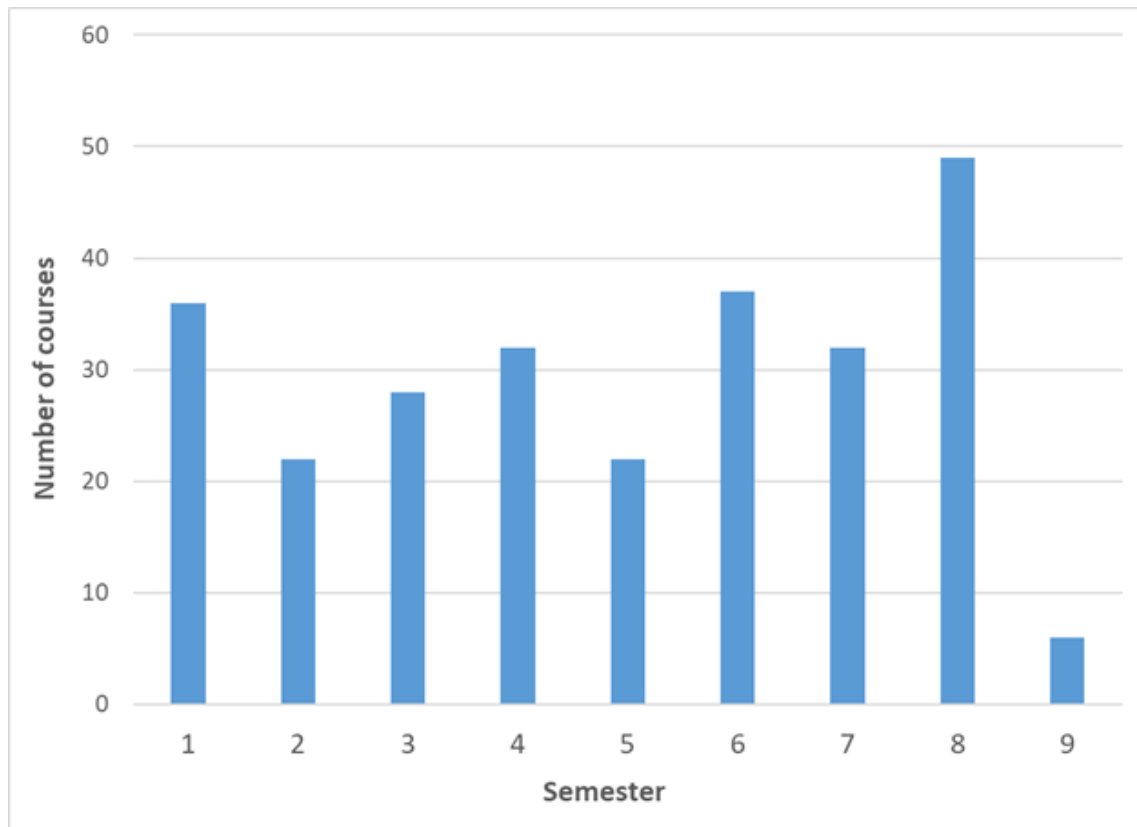


Figure 19. Distribution of entrepreneurial courses in semesters for 4 year Bachelor programs

- The distribution between the types of the courses is presented at figure 20. As it can be seen the majority of entrepreneurship courses in bachelor and master programs are compulsory. This means that students generally take at least one entrepreneurship related course during their study.

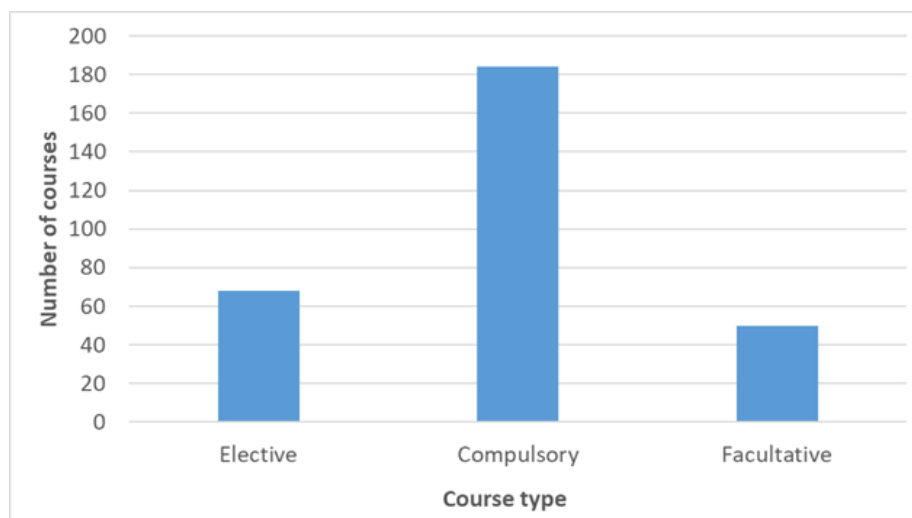


Figure 20. Number of compulsory, elective and facultative courses



- The topics of the courses that were included into the study can be roughly divided into four major categories:
 - Topics related to economics,
 - Topics related to management,
 - Topics related to entrepreneurship,
 - Compound topics that usually combine several subjects such as economics, management, marketing, etc.

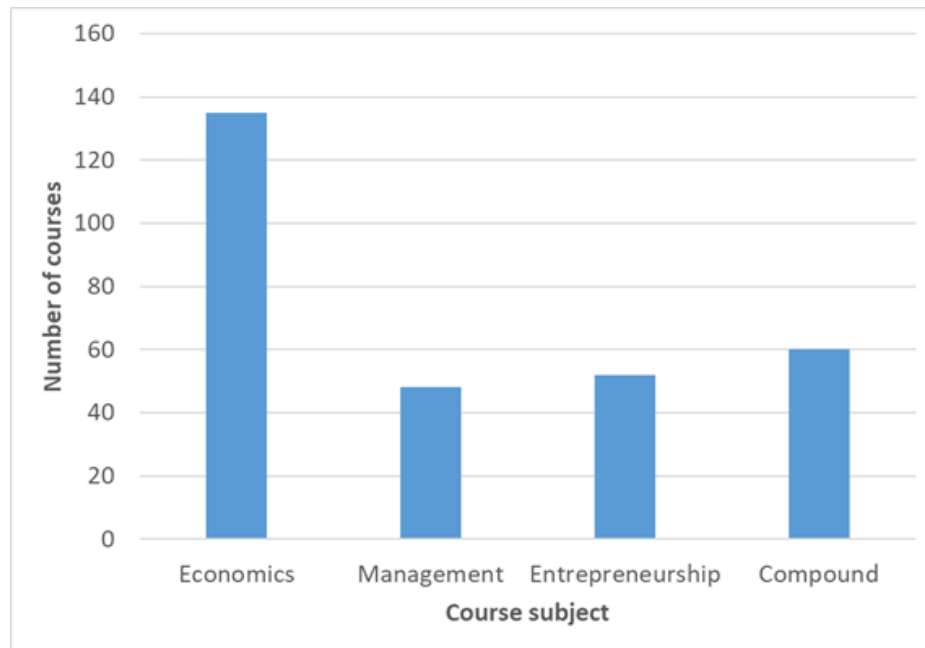


Figure 21. Distribution between the topics of the courses

The distribution of the different topics within the study is presented in figure 21. It can be seen that most of the studies include economics. The specific topics of the courses are presented at Tables 2-5.

Table 2. List of economic related topics

Economy related topics	
Business economics	Economy of industrial enterprises
Circular Economy of Building Construction	Economy of labor
Economics	Engineering economy
Economics in industry	Fundamentals of economic theory
Economics of agriculture	General Theory of Economics
Economics of Construction	Global economy
Economics of Construction and Architecture	Introduction to microeconomics
Economics of electrical power engineering	Macroeconomics



Economics of enterprises in the food industry	Management of enterprises in the food industry
Economics of furniture production enterprises	Market Economy
Economics of hydroconstruction	Micro and macroeconomics
Economics of industry	Microeconomics
Economics of transportation	Regional and Urban Economics
Economics of Water Supply and Sewerage Construction	Regional economics
Economics, Organization and Planning in Landscape Architecture	Transportation economics
Economy of enterprises	

Table 3. List of economic related topics

Entrepreneurship related topics	
Business and entrepreneurship	Entrepreneurship culture
Career growth and entrepreneurship	Entrepreneurship fundamentals
Company policy and entrepreneurial risk management	Fundamentals of social entrepreneurship
Construction Entrepreneurship	Innovation and entrepreneurship in the digital world
Enterprise management	Technological entrepreneurship
Entrepreneurship	Technological entrepreneurship and innovations

Table 4. List of management related topics

Management related topics	
Aviation management	Management of human resources in industrial enterprises Management of human resources
Business and financial management of transportation enterprise	Management of industrial enterprises
Ecological management	Management of innovations and industrial ownership
Enterprise management	Management of projects in IT
Facility management	Management of small and medium enterprises
Industrial management	Management Theory
Logistics management	Operational management



Management	Production management
Management of agricultural projects	Project management
Management of Construction Company	Quality management
Management of ecological projects	Transport management
Management of enterprises in the food industry	

Table 5. List of compound topics

Compound topics	
Company policy and entrepreneurial risk management	Management and marketing
Economic and Social Statistics	Management and marketing in car manufacturing
Economical risk (financial and entrepreneurial)	Management and marketing in transportation
Economics and management	Marketing and management in telecommunications
Economics and marketing	Marketing and management in transportation
Industrial management and marketing	Marketing and management of enterprise
Information systems for management and marketing in industry	Organization and Management of Construction

- The distribution of how many courses per bachelor program students take is presented at figure 22. It can be seen that students take mostly one course and rarely more than two. For this distribution a more in-detail view shows:
 - For programs that have only one entrepreneurship related course: 83 are compulsory, 18 are elective and 15 are facultative. This means that most programs have at least one course and some students might not have any entrepreneurship related training.
 - For programs that have two entrepreneurship related courses: 83 are compulsory, 48 are elective and 12 are facultative.
 - For programs that have only three entrepreneurship related courses: 18 are compulsory, 15 are elective and 18 are facultative.
 - For programs that have four entrepreneurship related courses: 14 are compulsory, 8 are elective and 16 are facultative.

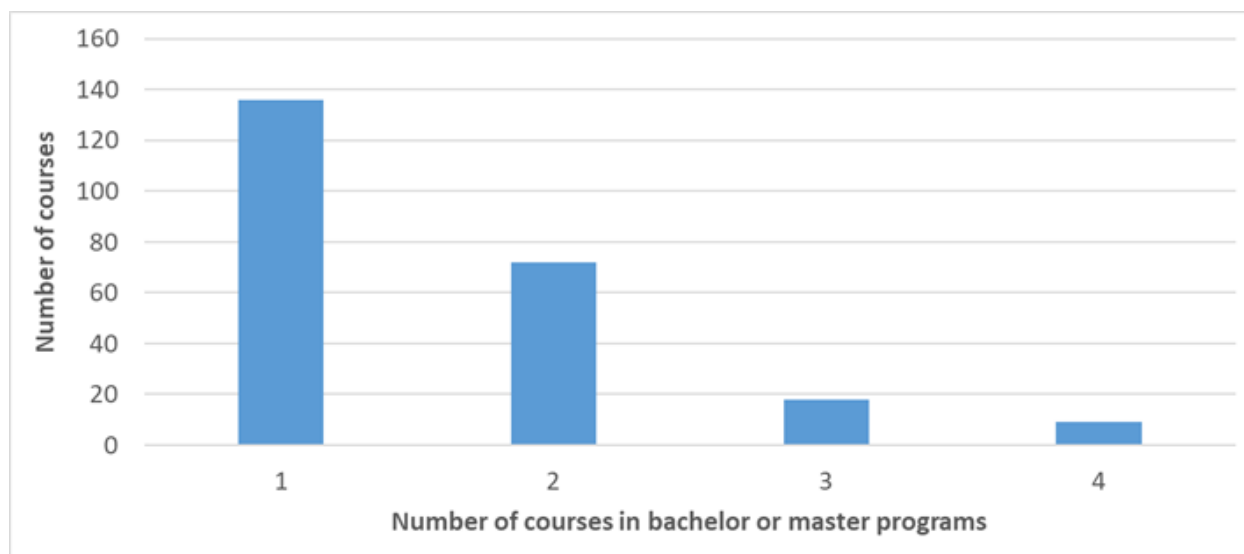


Figure 22. Distribution between the topics of the courses

Good Practices

Good and established practices in the field of entrepreneurship are observed in the following Bulgarian universities:

Good Practice 1: University of national and world economy

The university issues its own Startup bulletin, while also maintaining a section with news related to innovations and innovative ideas developed by students and pupils - potential future students and entrepreneurs. Through its website, the university informs about the essence, the main developmental steps, funding opportunities, and types of Startups. The university's website also informs about the available literature related to the development of startup companies. The university provides information about successful startups in Bulgaria over the last years, thus presenting two examples of good ideas and practices for startup development.

Good Practice 2: Economic university - Varna

The university establishes a startup program as part of its business accelerator. The program started in 2023, and from its initiation, competitive engagement of ten student startups is planned. The competition is for awards provided by the partnering organisations of the program.

The UEVA startup program is developed based on the model of the entrepreneurial network "Start for Future," supported by the European Institute of Innovation and Technology. The program includes training for developing business plans for students' ideas, mentoring by university professors, as well as by partnering business organisations.

Good Practice 3: Plovdiv University „Paisii Hilendarski“

The university is developing its Startup Academy within its technology transfer office. The aim of the academy is to support entrepreneurs in launching their business projects. This support is



expressed through conducting training to enhance entrepreneurial potential among university students. The university hosts regular open lectures related to entrepreneurship and startup companies. In the past year, lectures on the following topics have been realised:

- Financial instruments as alternative sources of funding from the European Commission and the InvestEU program, particularly financing for startups.
- Future professions in the entrepreneurship world: insights from PU students.
- How to find funding, develop, and successfully sell your business.
- From employment to entrepreneurship.
- Development of civil entrepreneurship.

The university also organises annual competitions for the best startup projects. The competition includes projects by students, doctoral candidates, and professors, with the best projects receiving support from the university in terms of finding partners and attracting investments.

Good Practice 4: Award for Young Entrepreneur of the Year

For three years now, the AmCham EU Youth Entrepreneurship Award has been presented in Bulgaria, targeting young entrepreneurs. In the past year, the award was won by Bulgarian entrepreneur Natalia Konova. She is the founder and CEO of the company AMIRA Meditech, which develops a software application for optimising antibiotic prescriptions in hospitals to combat antimicrobial resistance.

Summary of best practices in the field of entrepreneurship in Bulgarian universities.

From the described practices, the following generalisations can be made:

There is university support for assisting and developing student and doctoral entrepreneurial projects. Universities provide training, mentoring, contacts with potential partners and investors.

- Annual competitions are organised to select the best entrepreneurial projects in universities, with such competitions beginning to be organised at the national level as well.
- University accelerators and programs are in place to support student startup projects.
- There's an orientation of startup projects towards the development of software applications and platforms in the service sector, with some also supporting biological agriculture and environmental conservation.
- A significant portion of initiatives supporting student start-up projects are developed in universities with a humanities orientation, while this support is nearly absent in the technological universities of Bulgaria.

In conclusion, it can be said that good practices for supporting student startups in Bulgarian universities are present. Structures have been established for this purpose, training is conducted, mentoring is provided, and connections with investors and potential partners for student project development are ensured. Competition is fostered among student entrepreneurial projects, enabling focused support for the best projects. These practices are concentrated in universities



with a humanities orientation, suggesting possibilities for their expansion into the technological universities of Bulgaria, which are inherently involved in the creation of innovative technologies, the core of entrepreneurial activity.

Students' competences

The students' competence survey in Bulgaria received a total of 32 responses. 59% of the respondents are male and 41% are female (Fig. 23). The survey was answered by 6% of PhD students, 19% of master's students, and 75% of bachelor's students (Fig. 24). All of the respondents represent Physical and Engineering Sciences.

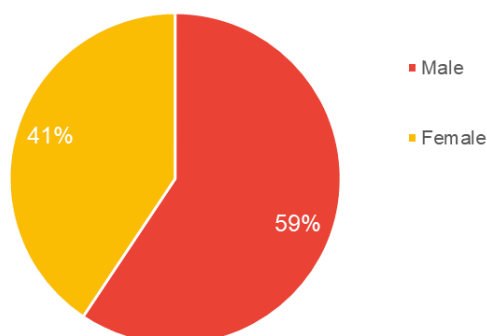


Figure 23. Gender distribution of the TUV's students sample

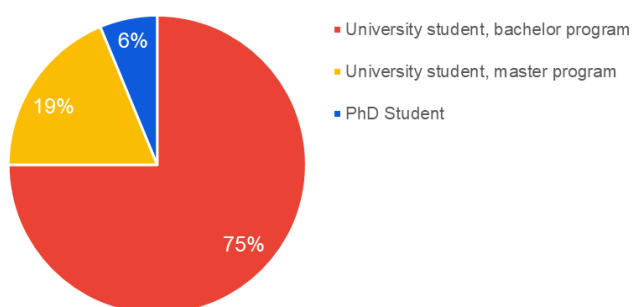


Figure 24. Distribution of the TUV's students sample based on the level of the study

Figure 25 shows the motivation of the students, studying at technical specialties. 64% of respondents are passionate about their professional field. 42% of the students consider that the



tech professional field will be the most important over the next 10 years and that this field is most related to the sustainable development goals. 12% of students are aimed at high salaries in the tech specialties labour market and believe that there is a good working opportunity in this field associated with travel. The least important motivational factors were friends' preferences (3%), and parents' opinion (9%).



Figure 25. Motivation for students to study tech specialties in TUV

We asked the respondents what the particular entrepreneurial skills are important for them.

Students marked all of the EntreComp entrepreneurial skills as important (Fig. 26). The most valued of them are: Spotting opportunities (67%), Creativity (67%), Financial & economic literacy (64) and learning from experience (55%).

Figure 27 shows the ways in which students obtain entrepreneurial competencies. Students develop their competencies in entrepreneurship at university (from 67% to 88%) mainly, in particular via formal learning (from 32% to 76%) and during informal learning through entrepreneurship supporting activities (from 17% to 34%). In addition, from 17% to 33% of students acquire entrepreneurship competencies outside of the university.

Students get the most from formal learning in HEIs to obtain competencies in Valuing ideas (76%), Vision (68%), Learning through experience (66%), Working with others (64), Spotting opportunities, Planning and management (58% both), Mobilising resources, Financial and economic literacy (52% for each option), Taking initiative (50%).

Informal education in HEIs contributes the most to the development of competences in Ethical and sustainable thinking (34%), Mobilising others (33%), Self-awareness & Self-efficacy (31%).

For the students knowledge obtained outside of University is relatively low, with highest numbers in Mobilising others (33%) and Self awareness and self efficiency (31%).

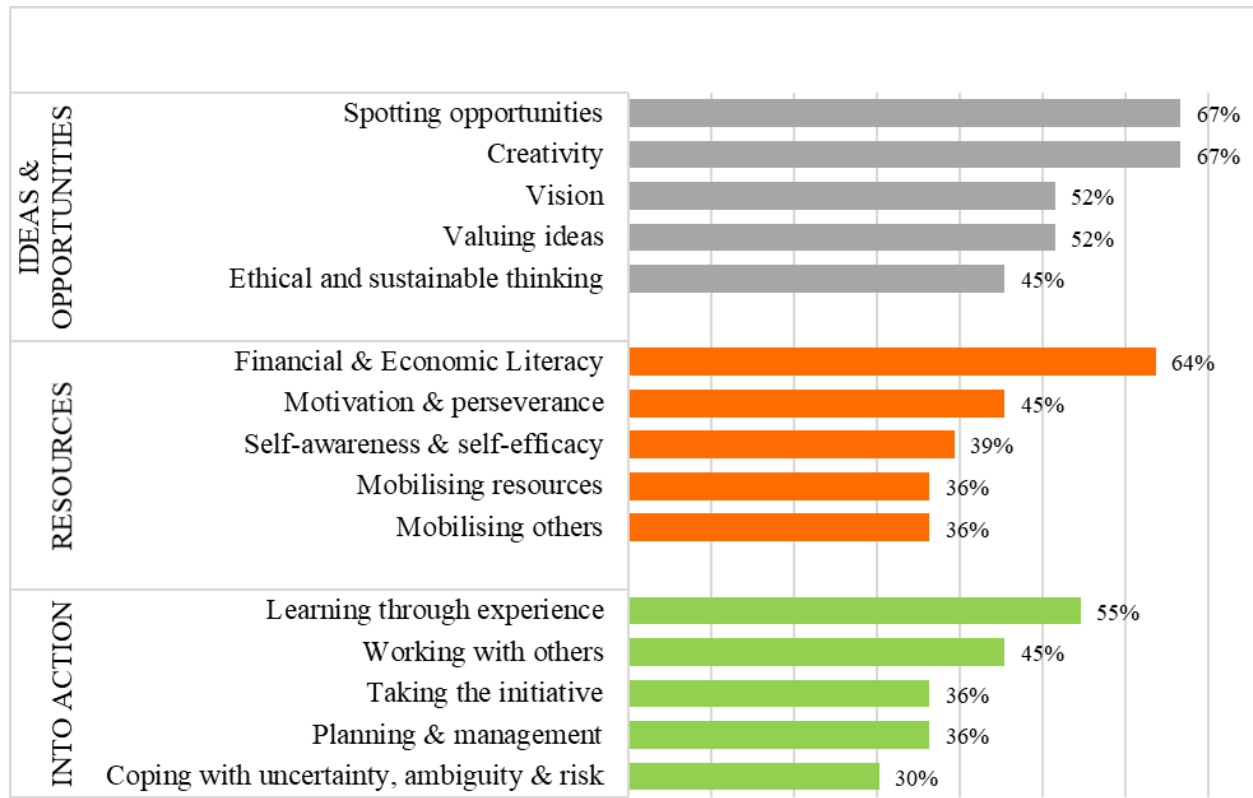


Figure 26. The importance of entrepreneurial competencies for TUV's students

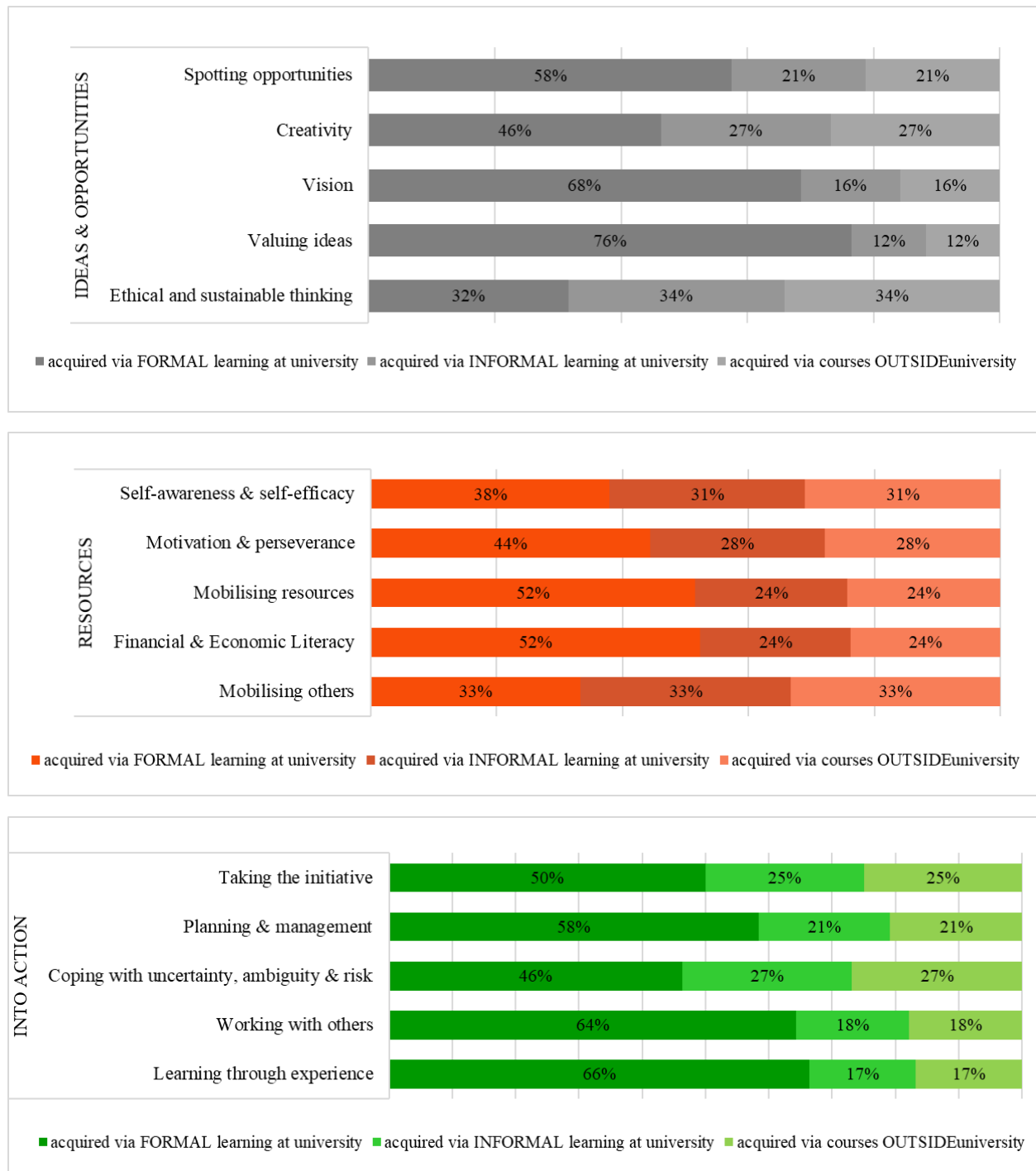


Figure 27. Entrepreneurship competencies and ways they are acquired by TUV's students

Students prefer conventional means (books and articles) to learn entrepreneurship (73%), whereas digital means such Social media platforms reach 52% and MOOC platforms (e.g., Coursera, EdX) 33% (Fig. 28).

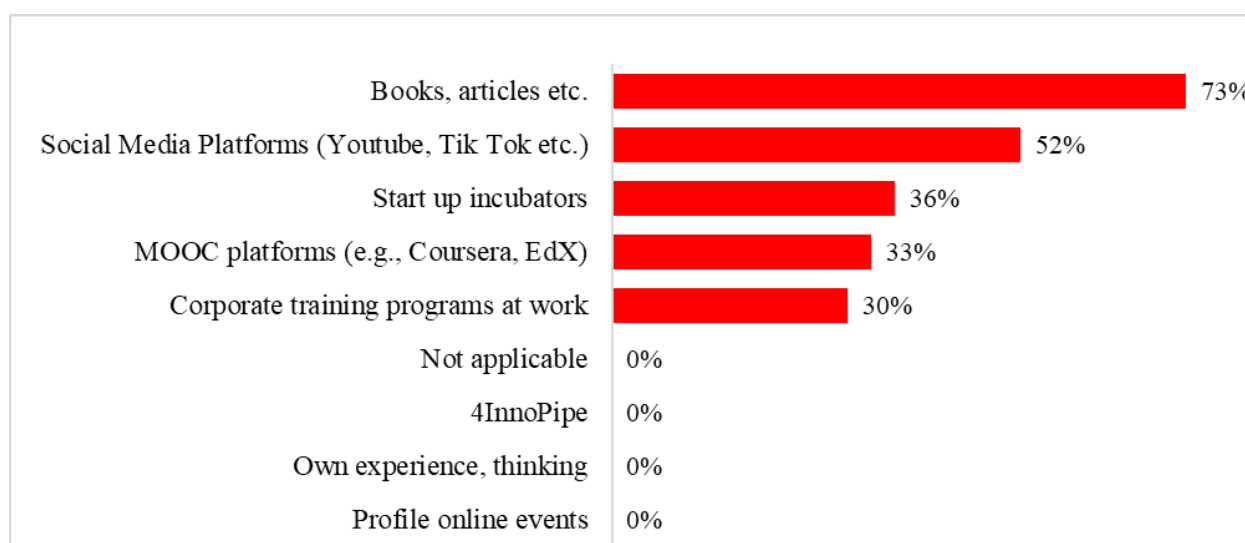


Figure 28. Platforms where TUV's students acquire entrepreneurship competencies

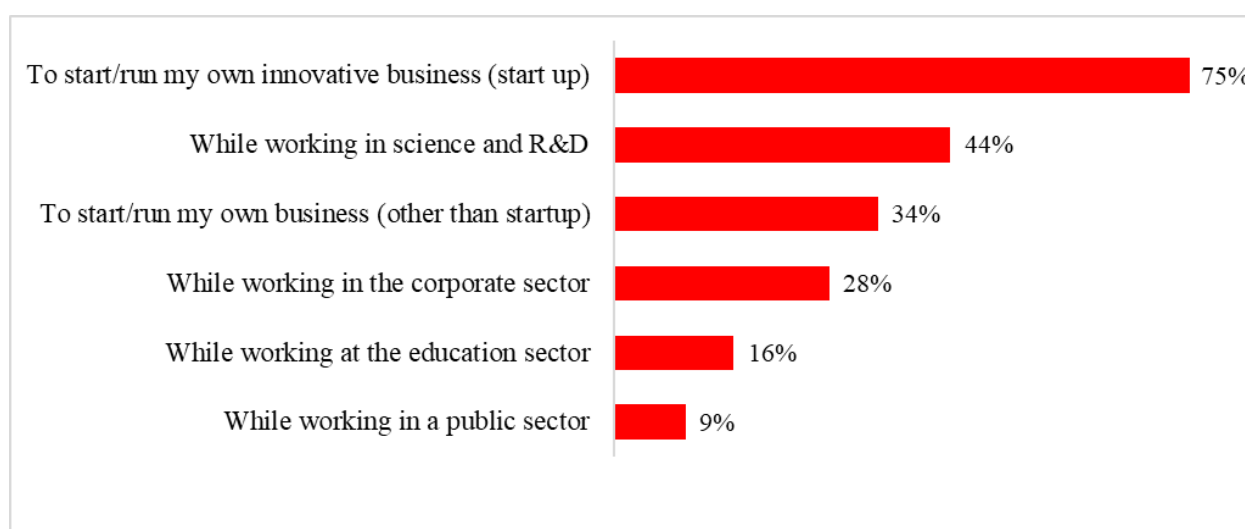


Figure 29. Students intentions to use their entrepreneurial competences

Figure 29 demonstrates the students' intentions for applying entrepreneurial skills: to start/run innovative business (Startup) - 75%, working in science and R&D - 44% and to start/run business (other than Startup) - 34%. These intentions emphasise the need for development of Startup and Prototyping infrastructure in HEIs. 28% of students are going to work in the corporate sector. 16% and 9% of respondents answered that they will apply their entrepreneurship competencies working respectively in the education sector and in public activities.

HEInnovate self-assessment

The HEI self-assessment highlights TUV's exceptional performance in the domain of digital transformation and capacity, underlining the university's robust capabilities in this area.



Notably, TUV achieved the highest score in this category, showcasing its strengths in embracing technological advancements.

However, the self-assessment also reveals that TUV received comparatively lower scores in domains related to entrepreneurship dimensions (Fig. 30). These lower scores indicate areas where proactive measures are needed to enhance performance. The assessment serves as an important indicator, shedding light on the university's potential for growth in entrepreneurship-related aspects.

Specifically, TUV's performance across the entrepreneurship dimensions is as follows:

- Entrepreneurial Teaching and Learning: Score of 3.6
- Preparing and Supporting Entrepreneurs: Score of 3.4
- Entrepreneurial Ecosystem and Networks: Score of 3.5

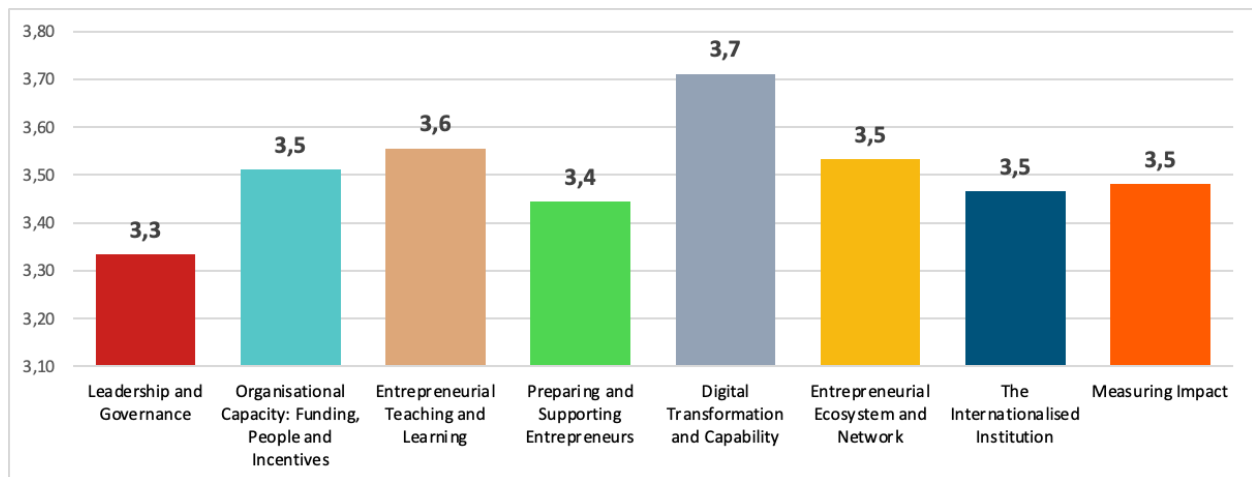


Figure 30. TUV HEInnovate self assessment

These scores provide insights into the university's current standing in fostering entrepreneurial education, support, and networking opportunities. By acknowledging these dimensions and their associated scores, TUV is well-positioned to strategically address areas of improvement and facilitate a more comprehensive and impactful approach to entrepreneurship within its academic ecosystem.



Figure 31. TUV's HEInnovate entrepreneurial dimensions

The self-assessment undertaken by the Technical University of Varna (TUV) spans multiple dimensions of entrepreneurial education and support. The results, depicted in figure 31, provide valuable insights into the university's strengths and areas that warrant further development.

In terms of Entrepreneurial Teaching and Learning, TUV offers an array of formal learning opportunities aimed at fostering entrepreneurial mindsets and skills among students. The formal learning component scores 3.78, while informal learning registers a score of 3.67. Notably, TUV effectively integrates research outcomes from entrepreneurship into its educational offerings (earning a score of 3.56), ensuring students have access to current insights and knowledge. However, enhancing the collaborative integration of research outcomes into entrepreneurial education remains an area for growth. The entrepreneurial curriculum boasts well-defined learning outcomes (scoring 3.56) that align with external stakeholders' needs (scoring 3.22), but there's potential for enhancing the quality of entrepreneurial education at TUV.

TUV demonstrates a strong commitment to Preparing and Supporting Entrepreneurs, evident in its initiatives to raise awareness (scoring 3.44) about entrepreneurship and stimulate entrepreneurial intentions among students, graduates, and staff. The university provides holistic support from idea generation to business creation (scoring 3.33), inclusive of training (scoring 3.44) and mentorship (scoring 3.89) by experienced individuals from academia and industry. TUV's dedication to facilitating access to financing (scoring 3.22) and providing business



incubation opportunities (scoring 3.33) significantly contributes to its ecosystem, with Norinnova being one of the mechanisms employed to support students and staff.

In the realm of Knowledge Exchange and Collaboration, TUV excels in forging collaborations with industry, the public sector, and society (scoring 3.56). The university actively engages with diverse stakeholders, cultivating robust partnerships that contribute to a dynamic and knowledge-sharing environment (scoring 3.67). While TUV maintains strong links with external initiatives such as incubators and science parks (scoring 3.22), there's potential for further growth in this dimension. Moreover, TUV encourages staff and students to participate in innovative activities with businesses and the external environment (scoring 3.67) while integrating research, education, and industry activities to leverage new knowledge (scoring 3.56).

In summary, TUV's HEI self-assessment highlights areas that demand further attention and development within the university's entrepreneurial ecosystem. While these figures showcase certain aspects of TUV's value and progress, they also shed light on potential avenues for improvement. The numbers illuminate critical areas that call for focused efforts and enhancement. The university acknowledges these challenges and is committed to addressing them in order to advance its entrepreneurial initiatives, ultimately ensuring a more robust and impactful ecosystem for the benefit of students, graduates, and the broader community.

Kyiv Academic University KAU

Regional landscape and good practices

The educational landscape of entrepreneurship in Ukraine was researched based on information from 24 universities that work in the fields of technical education and/or occupy leading positions in the development of entrepreneurship support ecosystems. Among the 24 analysed HEI, 9 are among the top technical higher education institutions of Ukraine according to the 2022 rating, and 15 have experience in developing innovative entrepreneurial ecosystems.

Top tech leading HEI are presented by: National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”, Lviv Polytechnic National University, Kharkiv National University of Radio Electronics, National Technical University «Kharkiv Polytechnic Institute», National Aviation University, National Aerospace University «Kharkiv Aviation Institute», Dnipro University of Technology, Vinnytsia National Technical University, Odessa Polytechnic National University.

Moreover, in order to study good practices, the relevant activities of Ukrainian HEI were studied for: Ukrainian Catholic University, Taras Shevchenko National University of Kyiv, Oles Honchar Dnipro National University, Zaporizhzhia Polytechnic National University, National University of Water and Environmental Engineering, Polissia National University, Cherkasy State Technological University, Institute of Applied Physics and Computer Sciences, Yuriy Fedkovych Chernivtsi National University, Department of Computer Systems and



Networks, Ternopil Ivan Pului National Technical University, Volodymyr Dahl East Ukrainian National University, Lutsk National Technical University, National University of Kyiv-Mohyla Academy, Kyiv Academic University, Sumy State University (SumDU), Vasyl Stefanyk Precarpathian National University.

The study of the activities of Ukrainian HEIs in the field of entrepreneurship education, as well in the support of entrepreneurship through measures and infrastructure development, showed the following results.

Entrepreneurial education is represented by disciplines included in bachelor's and master's level educational programs in the fields of entrepreneurship, management of startup projects, marketing of startup projects, commercialization of research developments, economics and organisation of production, innovative development, environmental management, intellectual property and patent science, legal support of entrepreneurship. These disciplines are mainly included into the set of elective disciplines. In addition, they are covering general economic and management perspectives, lacking the focus on innovations and entrepreneurship.

Entrepreneurship support activities are delivered via workshops, discussion panels, entrepreneurship competitions, mentoring support, conferences and journals, digital support, fundraising, participation in grant programs, networking and partnership with innovative ecosystems.

The most developed criteria for activity are partnership interaction, special digital support, workshops, startup competitions, and entrepreneurship schools. Fundraising activities and grant programs are not well developed.

The analysis of the positioning of the university showed the following emphasis in the declaration: combination of science, education and innovation, cooperation with business, growth of creativity, development of start-ups, commercialization and development of innovations, patent and licence provision and transfer of technologies, applied IT, digitalization, international scientific cooperation. Practices and results of supporting entrepreneurship in HEIs correspond with the positioning directions.

Entrepreneurial infrastructure study revealed development of special centres for entrepreneurship and innovations, incubators and incubation programs, technology transfer centres (labs, hackathons), innovative technology parks, startup schools, funding funds, research infrastructure (research and innovation labs, centres). At the same time, prototyping labs and accelerators are underdeveloped within the university ecosystems.

Ukrainian HEI landscape study in fields of entrepreneurship discovers good practices.

Good Practice 1. [Noosphere Engineering School](#)

Noosphere Engineering School is a network of scientific and technical laboratories integrated with the HEIs in Ukraine and equipped by the NGO "Association Noosphere. These laboratories provide technical infrastructure, technical and business mentoring support for



students and young professionals to work on their start up projects. Having started with space industry innovations, now Noosphere is focused on all the deeptech spheres - from new materials to alternative energy. Figure 32 depicts Noosphere's ecosystem.

The main goal of the Noosphere's labs is to help students to develop a working prototype. After reaching this goal, Noosphere provides projects with further support as a real startup.

Each Noosphere lab has a responsible person assigned from the university's academic staff. This practice allows effective interaction between students and their university teachers, and provides better motivation for developing start-up ideas. The university representative is responsible for all the Noosphere activities in a particular university, and also - for the progress of the projects (see Fig. 33).

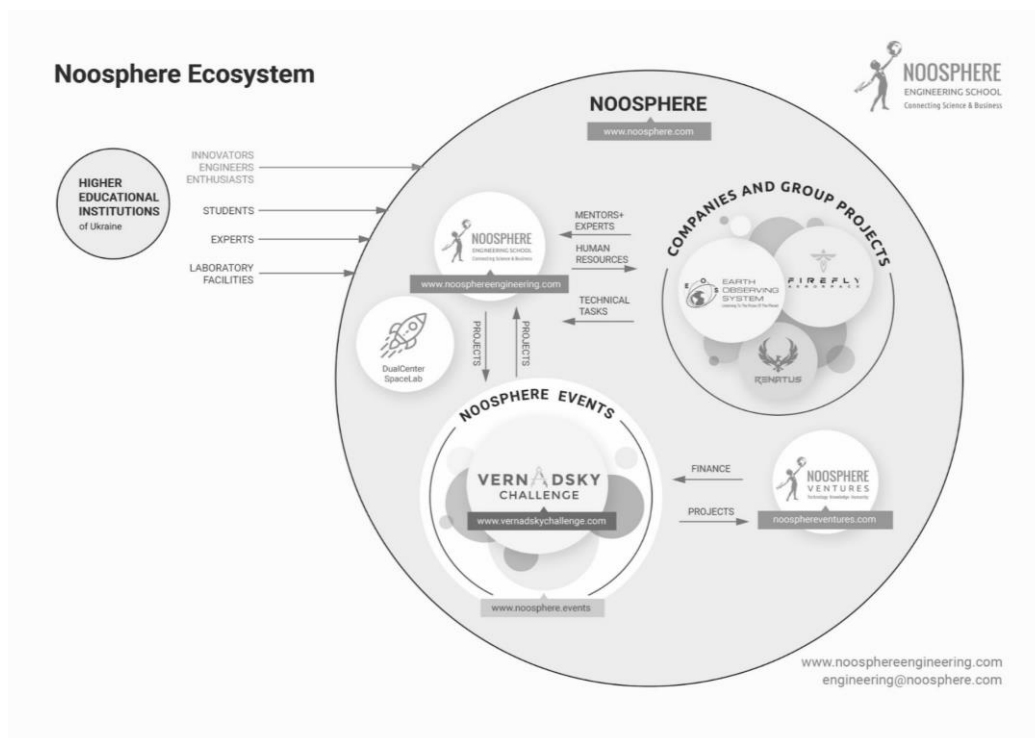


Figure 32. Noosphere's Ecosystem⁷

⁷ <https://noosphereengineering.com/>

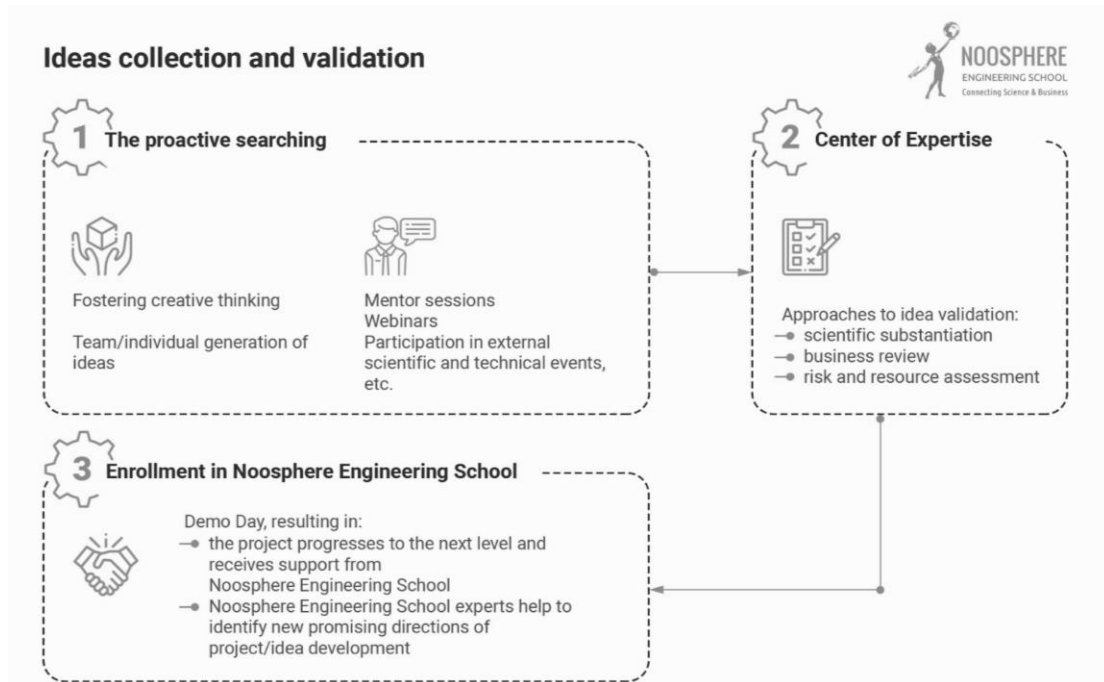


Figure 33. How start-up ideas are growing at Noosphere labs⁸

Noosphere pays a lot of attention to networking activities within a university and among different universities. Noosphere is a pioneer in various innovation contests for students, for instance drone raceship. It also actively encourages and supports the students' participation in international innovation competitions (see Fig. 34).

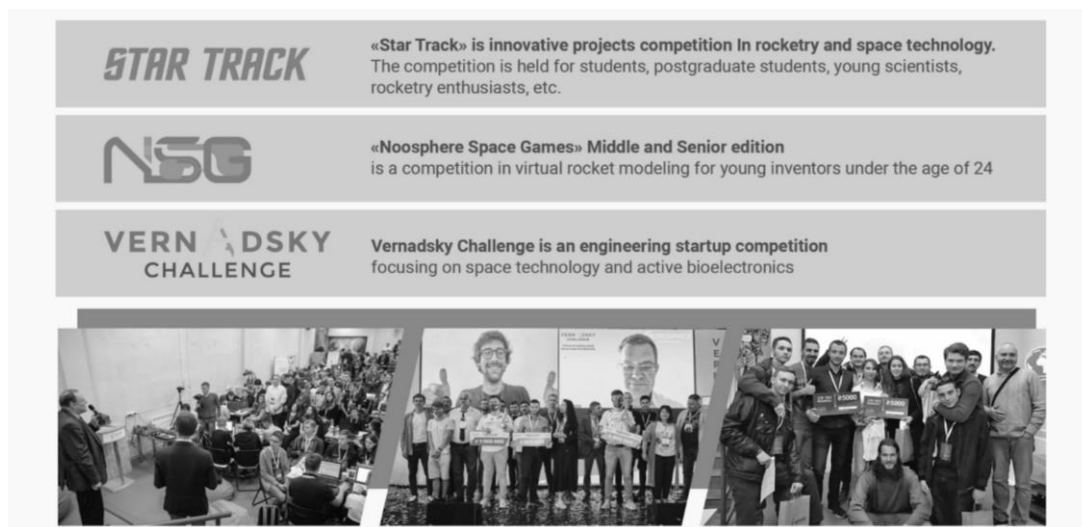


Figure 34. How start-up ideas are growing at Noosphere labs⁹

⁸ Ibid.

⁹ Ibid.



Currently the laboratories of Noosphere Engineering School are established in 8 Ukrainian universities where more than 60 innovation projects were developed (see Fig. 35).

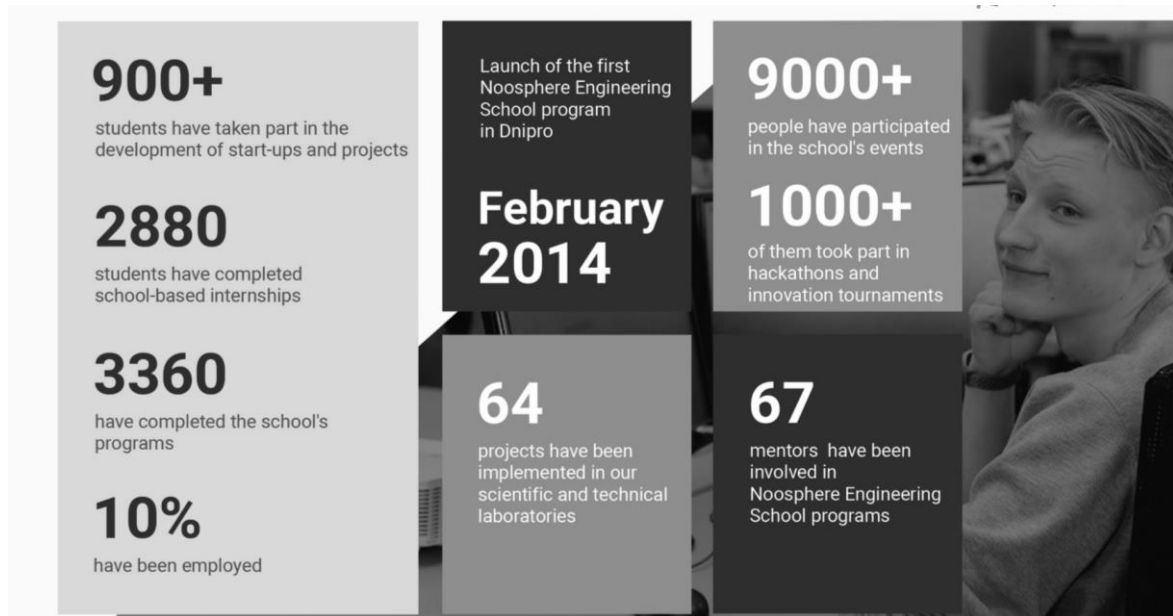


Figure 35. Noosphere Engineering School results¹⁰

Good Practice 2. [Innovation Ecosystem Sikorsky Challenge](#)

Innovation Ecosystem Sikorsky Challenge was founded to carry out the selection, recruitment and training of creative people to create their own business and start-ups, helps participants to find the investors and the promotion of start-ups.

Sikorsky Challenge Innovation Ecosystem includes: Startup School «Sikorsky Challenge»; Festival of innovation projects «Sikorsky Challenge»; Business Incubator «Sikorsky Challenge»; Innovative technological environment «Sikorsky Lab»; Center for Intellectual Property; Venture Fund «Sikorsky Challenge» (see Fig. 36).

Ecosystem Sikorsky Challenge aimed at entrepreneurship development in:

- education – training for business idea development and implementation in projects;
- supporting measures – looking for investors, engagement of innovative people, scientists and students, universities, research institutes, as well as representatives of business, participation in the opening and running start-up companies, support for the protection of intellectual property rights, prototyping of innovative products;
- building an ecosystem – composition of education, networking, partnership, innovative technological development, funding, intellectual property and mentorship support, business support.

¹⁰ Ibid

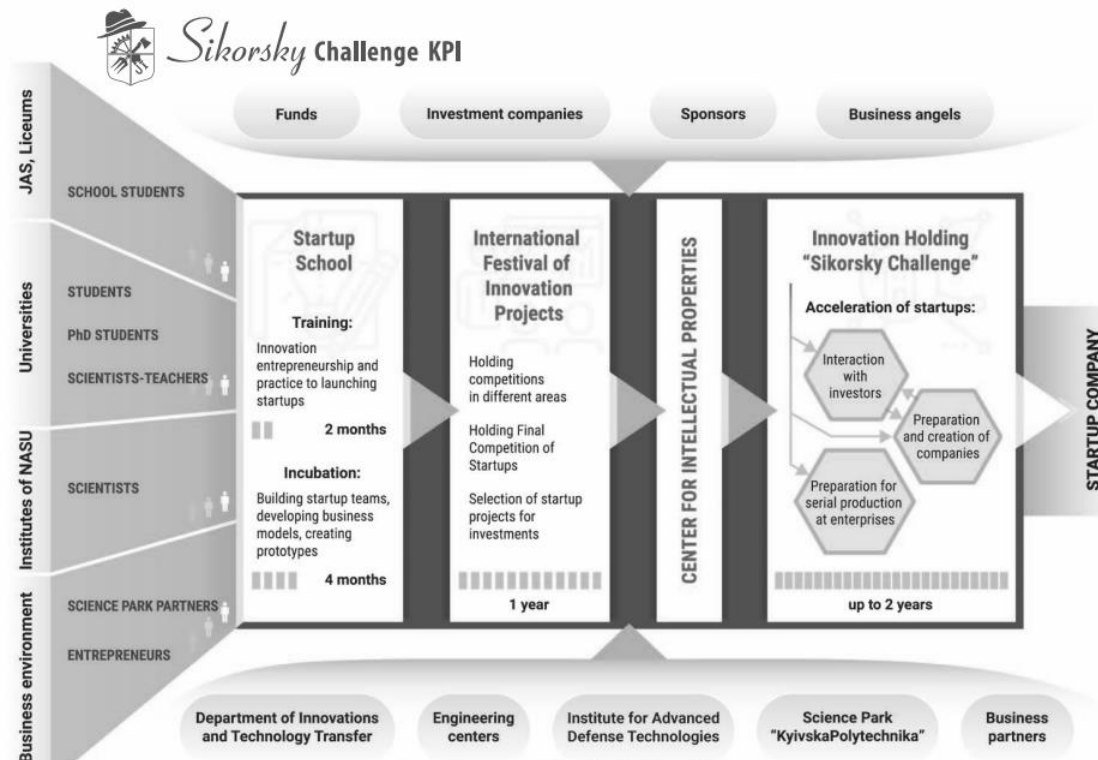


Figure 36. Sikorsky Challenge Ecosystem¹¹

According to SCU teaching techniques, the training of startup school students consists of four stages. Training under the program "Innovative entrepreneurship and practice of launching startup", Incubation, Participation of selected teams in competitions of startups of the city/region, Acceleration of start-up projects "targeted to" the investor/investors.

"At different stages of startup development in Startup Schools "Sikorsky Challenge" funding can come from various sources. Thus, the 1st and 3rd stages (training and competition) may be funded by sponsors, grant funds, city development funds. Startup projects at the 2nd, and especially at the 4th stages (incubation and acceleration), in addition to funding from grant funds and city funds, can and should receive "preseed" investments from investment companies and venture funds"¹².

<https://drive.google.com/file/d/13WN6bbbH2LwUVbdMctkCqJOxoAVsnRsmH/view>

During 2014-2021, more than 1,500 innovators aged 15 to 68 were trained at the Startup Schools "Sikorsky Challenge". About 400 startup teams were selected for incubation; 75 startup projects passed the acceleration program. Each year about 40 projects won the International Festival of Innovation Projects "Sikorsky Challenge", in 2021, the number of finalists reached 130 projects, including 69 winners (see Fig. 37).

¹¹ <https://kpi.ua/en/ecoino>

¹² <https://drive.google.com/file/d/1CbSz9tVRpUY8CEfKUfDZ-mf2H47K6yRU/view>

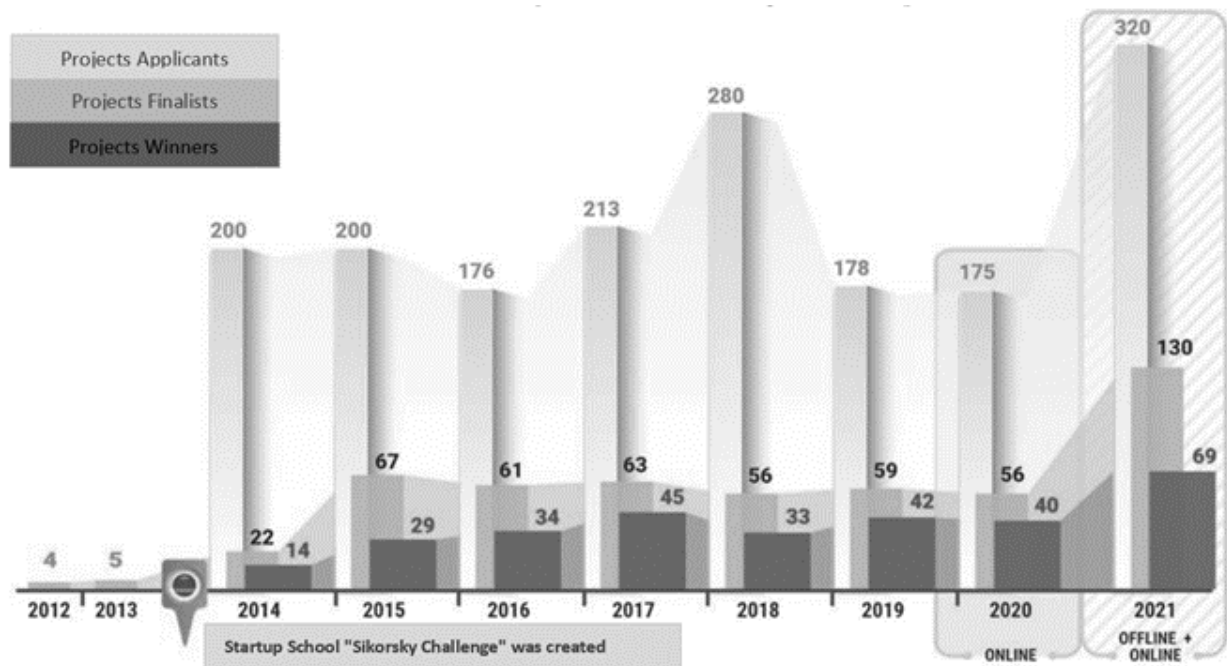


Figure 37. Startup Schools "Sikorsky Challenge" results¹³

Good Practice 3. [Tech StartUp School of Lviv Polytechnic National University](#)

Tech StartUp School of Lviv Polytechnic National University is a comfortable innovative environment for the development and implementation of creative ideas and successful start-ups, which operates on the basis of Lviv Polytechnic. The Tech StartUp School team helps innovators go from idea generation to building a business model, seeking investment and commercialising an innovative project.

Tech StartUp School Facilities cover Open Space (1100 m².4 floors) with equipped rooms (see Fig. 38) and assistance in organising events of any format and complexity, and includes event space for 120 people, VR laboratory, two innovative educational spaces - biotechnological and digital (with a focus on 3D modelling), Research Centre for Hydrogen Technologies, Museum of Science and Innovation.

Tech StartUp School ecosystem includes:

- BioTechHub
- Museum of Science and Innovation
- The Tech StartUp School
- Tech Acceleration program
- StartUps BoostCamp
- The Creative Spark programme

¹³ <https://kpi.ua/en/ecoino>



Figure 38. Tech StartUp School Facilities¹⁴

BioTechHub, an innovative biotechnology laboratory with free access, is a centre for the implementation of biotechnology ideas and start-ups. The laboratory is equipped with innovative equipment for DNA research and conducting biotechnology experiments. Residents of the laboratory are able to implement their ideas, receive mentoring support, become part of a team of highly qualified scientists, and find like-minded people to conduct research and experiments.

The game and interactive exhibitions of the **Museum of Science and Innovation** are focused on promoting technology, science and innovation. Innovations are the changes needed to improve the future, transform the economy and society. The museum is designed as a place for experimentation, which provides an opportunity to implement ideas, to develop projects, and an impetus to discover oneself.

The Tech StartUp School of Lviv Polytechnic already has a successful history of acceleration programmes. Among the success stories are the well-known Skeiron company and other successful startups. Professional business coaches of Tech StartUp School are certified by the University of Keighston (UK).

Tech Acceleration program of Tech StartUp School is a programme to provide intensive project development services through training, mentoring and expert support to the project on its way to commercialisation and market entry. The structure of the programme was developed jointly with Kingston University. Training blocks include Idea validation, Study of the target audience, Marketing part and sales, Business modelling, Business strategies and innovations,

¹⁴ <https://lpnu.ua/proiektnyi-ofis/pro-ofis>



Project management, Budgeting, financial planning and forecasting, Investments, Risk management, PR and reputation management, Communications and negotiations, Personal brand and networking, and Pitching training part (presentation and pitch deck).

StartUps BoostCamp is a training course designed for new start-ups in the agri-tech and food industry. During the intensive course, participants learn key business methods and tools that will help them promote their projects and ideas, receive expert advice, prepare their pitch presentations, and get opportunities to attract partners and investors, including through the StartEra programme.

The Creative Spark programme, as part of the grant cooperation with GIST IHUB, aims to develop business skills among students, start-ups and young entrepreneurs. During the Creative Spark intensive training, participants will learn trends and analysis of the startup ecosystem, target audience and blue ocean strategy, marketing and digital marketing in the startup world, communication with the client, team building, attracting investments, startup presentation and pitching. At the end of the programme, the participants will present their ideas and will have the opportunity to take part in the international video pitch competition Big Idea Challenge.

Good Practice 4. [Center for Entrepreneurship of UCU Business School](#)

CfE Accelerator is an accelerator for Ukrainian startups whose mission is to develop the startup culture in Ukraine and increase the competitiveness of Ukrainian startups in the global startup ecosystem. The CfE accelerator was created in 2017 as a separate project of the UCU Business School called the UCU Entrepreneurship Center. From 2022, the CfE accelerator operates as a separate structure that is part of the UCU ecosystem and corresponds to the values and global mission of the Ukrainian Catholic University.

The UCU Center for Entrepreneurship has been successfully developing the ecosystem of innovation, entrepreneurship, and startups around the UCU Business School and the Ukrainian Catholic University conducting its activities and training programs for several years. During its history, the CfE accelerator has united more than 170 Ukrainian startups. The accelerator includes more than 8 products and programs, including:

An **Acceleration program** that allows innovators to focus on their startup, rethink false theories, look at a product differently, get tools for its development, and accelerate the transformation of an idea into a viable product.

A **Pre-acceleration program** is a test of innovative ideas for viability and their subsequent transformation into products at an early stage with the help of simple and effective tools.

Ideas Lab is a student innovation platform that helps to develop entrepreneurial thinking and become a startups.

Meetups4Startups – informal meetings for the startup community.

The main values of the CfE accelerator are:



GLOBAL THINKING: CfE Accelerator supports teams with a global mindset and those who are ready to scale. The best teams have the opportunity to go to the USA to further immerse themselves in the global startup ecosystem and gain valuable acquaintances and experience.

COMMUNITY: Graduates of the CfE Accelerator make valuable acquaintances that stay with them long after the program ends.

RELEVANCE OF PROGRAMS AND MENTORS: CfE accelerator is a professional high-quality training program, as well as an international network of mentors, experts, and partners who want to contribute to the realisation of our mission.

In 2022, another important event for the activity of the CfE accelerator took place.

The UCU Foundation created the angel **venture fund Angel One**, the task of which is to invest in Ukrainian startups at the early stages, including CfE accelerator veterans.

The goals of Angel One are:

- Cultivate an entrepreneurial culture in Ukraine through educational activities, meetings, and events;
- Provide professional high-quality training programs for startup ecosystem participants;
- Grow an international network of mentors, experts, and partners who are willing to contribute to our mission;
- Develop the Ukrainian startup ecosystem and promote its role in the global ecosystem by educating and connecting its participants.

CfE accelerator's slogan is "Nurturing Ukrainian startup culture" because a feature of the accelerator is the opportunity to receive investments from CfE accelerator and Angel One, as well as work with authoritative mentors and a strong community of Ukrainian startups with a global mindset.

Good Practice 5. [7 Wings Fund](#)

UCU Business School became the co-founder of the 7 Wings Fund, which was launched in 2022 (see Fig. 39). The goal of the project is to create a network of partners willing to help Ukraine. The fund aims to provide grants to Ukrainian startups and Tech companies in the amount of \$50 000.

The initiators of the project are Ivan Petrenko, CEO of the Center for Entrepreneurship of the Ukrainian Catholic University, and Denys Dovhopolyi, CEO of UnicornNEST. UCU Business School and the Center for Entrepreneurship of UCU became the co-founders of the fund.

Its goal is to create a bridge between Ukrainian startups who despite the war stayed in the country and continue to run their companies and those foreign donors, investors, businesses, and experts, who want to help the stalled Ukrainian economy to rise. It was one of the reasons this initiative was born - a strong desire of our friendly investors, businesses, and corporates in



Europe and the US to keep the Ukrainian economy afloat through the support of tech companies.

Now the foundation has announced the first 6 teams that will receive grants of \$50,000. Startups from Odesa, Kyiv, and Lviv were selected, namely **Book Box**, **Kycaid Limited**, **DrugCards**, **CASES**, **ByOwls**, **AcademyOcean**. Startups will use grant funds to support Ukrainian teams while scaling up and accelerating their potential in other markets within the following areas:

- **DEFEND:** Tech companies that are on guard of people, freedom and values [cybersecurity, defence tech, legal tech, AI]
- **REBUILD:** Solutions that accelerate reconstruction and restore people's lives [home rebuild, infrastructure, logistics, foodtech, 3D printing]
- **INNOVATE:** Startups envisioning and bringing the future of energy, agriculture, production and other vital tech (greentech, energy, automotive, robotics, drones, VR)
- **DRIVE:** Those who grow potential of fields waiting to be disrupted (edtech, fintech, healthtech, aerospace)
- **RESHAPE:** Teams striving to reshape global economy (martech, retail, e-commerce, traveltech, media & entertainment)
- **CONNECT:** Ukrainian tech ecosystem bringing services to the global markets and becoming part of changing global environment

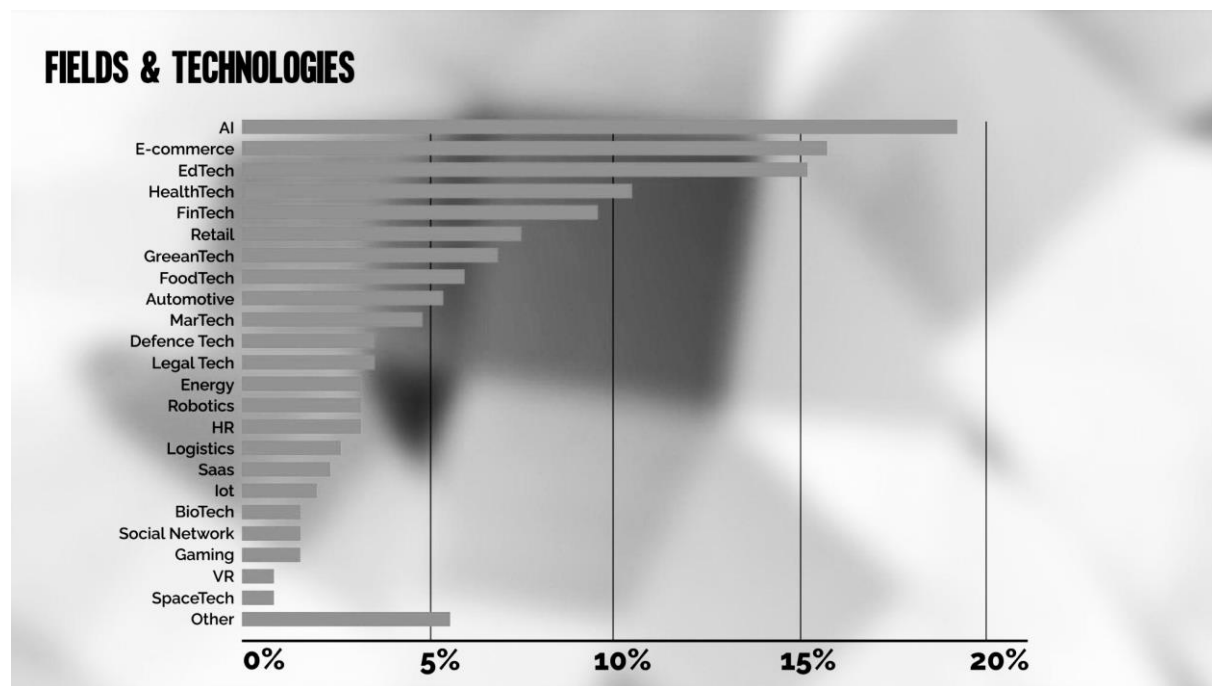


Figure 39. 7Wings technology portfolio ¹⁵

The Foundation supports startups according to certain criteria:

- At least 70% of the startup team remains in Ukraine regardless of registration;

¹⁵ <https://www.7wings.tech/>



- The startup product is on the market and brings initial income;
- Burnout rates range from \$ 10,000 to \$ 25,000;
- In addition to money, the foundation will support the companies with mentoring, education, and contacts from the first day of cooperation.

The fund also has differentiation points:

- Recommendations from reputable suppliers in the market;
- Board investors are ready to join the round or investors who want to join the company with a grant.

The application procedure consists of seven main stages:

- Filling in the application form;
- Screening;
- The deep but fast procedure of due diligence (detailed independent inspection of the investment object, to form an objective view of the investment object);
- A call with investors and co-investors (if any);
- Signing a contract;
- Crediting money to the account;
- Startup report on the use of funds from investors.

Summary of good practices in the field of entrepreneurship in Ukrainian universities.

From the described practices, the following generalisations can be made:

Entrepreneurial ecosystem provides sufficient support to startups and entrepreneurs. Universities are developing networks and infrastructure, providing educational and mentoring support in fields of entrepreneurship.

Entrepreneurship support activities provide infrastructure and mentoring for startups founders and entrepreneurs, promoting startups and finding investors.

Networking activities within HEI and among universities supports students' participation in local and international competitions.

Innovation laboratories are organised and operating to develop entrepreneurs' innovation projects.

Educational initiatives in fields of entrepreneurship and innovation ensure training of creative entrepreneurs, developing more business ideas as well as implementing them in projects.

Training and tech startups schools and acceleration programs are developed as centres for implementation of ideas and launching startups.

Building ecosystems as a composition of scientific, educational, business, legal, technological support is in focus of development.



Students' competences

The students' competence survey in Ukraine received a total of 54 responses. 30% of the respondents are female and 70% are male. The survey was answered by 2% of PhD students, 52% of master's students, and 43% of bachelor's students. 74% of respondents represent Physical and Engineering Sciences, 26% are studying Life Sciences.

The respondents represented Ukrainian universities with tech specialties, including Kyiv Academic University, Chernihiv Polytechnic, Ukrainian Academy of Printing, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Taras Shevchenko National University of Kyiv, Vinnytsia National Technical University, University Ukraine, Wurzburg University, National University of Kyiv-Mohyla Academy, V. Bakul Institute for Superhard Materials, WSB University, Sumy State University, University of Applied Sciences of Burgenland, Kyiv National University of Technologies and Design. About 40% of the answers were obtained from KAU students.

Figure 40 shows the motivation of the students, studying at technical specialties. 85% of respondents are passionate about their professional field. Students consider that the tech professional field will be the most important over the next 10 years. Contributing to SDGs is the ambition for 54% of the respondents. For 52% this fact was crucial for their choice of speciality. 48% of students are aimed at high salaries in the tech specialties labour market.

More than 35% of students chose the technical speciality because their skills in this professional field are the strongest. Prospects of working and travelling during studies were the choice motivation for 33% and 26% respondents respectively.

The least important motivational factors were the same professional field of parents and close relatives (9% of responses), friends' preferences (6%), and parents' opinion (4%).



Figure 40. Motivation for students to study tech specialties in Ukraine



82% of respondents agreed that entrepreneurial skills are important for them. We asked the respondents what the particular entrepreneurial skills are important for them.

Students marked all of the EntreComp entrepreneurial skills as important. The most valued of them are: Valuing ideas (76%), Financial and Economic Literacy (76%), Spotting opportunities (74%), and Planning & management (72%). All the skills in the section of INTO ACTION have a high level of importance for the respondents (see Fig. 41).

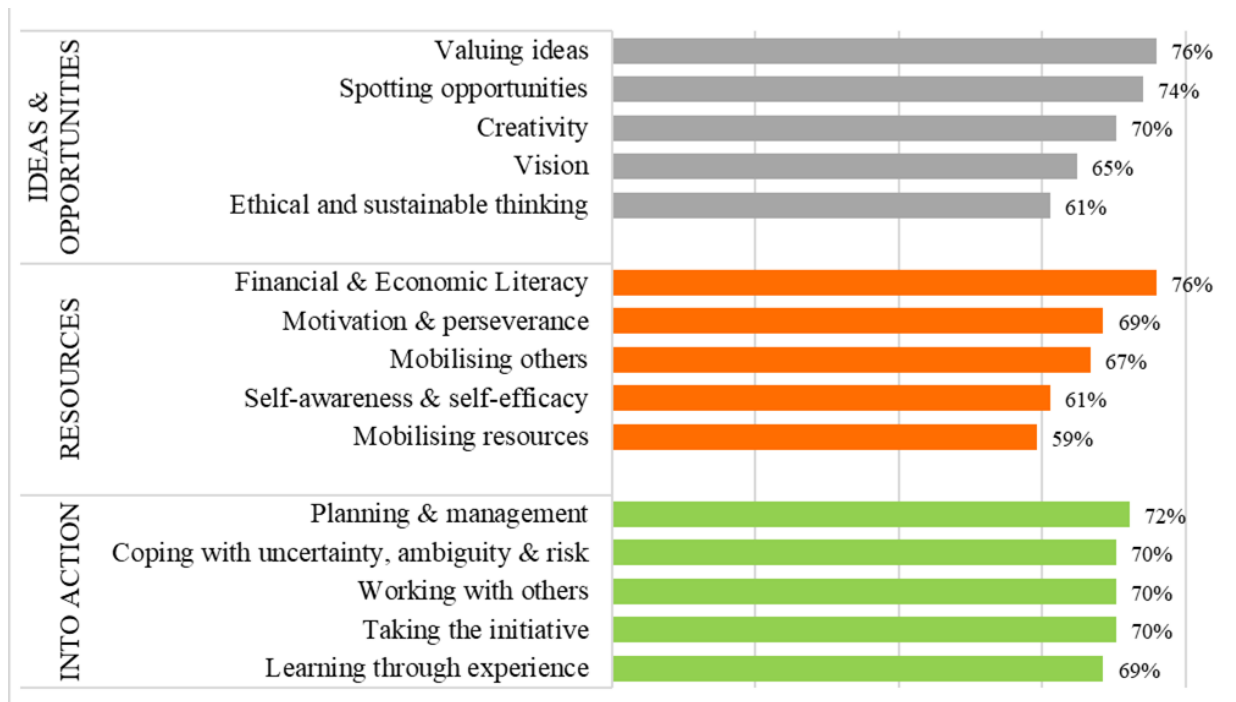


Figure 41. The importance of entrepreneurial competencies for students in Ukraine

Figure 42 shows the ways in which students obtain entrepreneurial competencies. Students develop their competencies in entrepreneurship at university (from 55% to 75%) mainly, in particular via formal learning (from 25% to 46%) and during informal learning through entrepreneurship supporting activities (from 28% to 48%). In addition, from 23% to 46% of students acquire entrepreneurship competencies outside of the university.

Students get the most from formal learning in HEIs to obtain competencies in Planning & management (46%), Ethical and sustainable thinking (45%), Mobilising resources (44%), Taking the initiative, Working with others, Learning through experience (41% for each option), Motivation & perseverance, Creativity, Valuing ideas (37% for each option), Vision (36%).

Informal education in HEIs contributes the most to the development of competences in Spotting opportunities (48%), Mobilising others (40%), Self-awareness & Self-efficacy (36%).

Despite the highest significance for students, Financial & Economic Literacy is provided within HEIs at a low level (23% for formal education and 31% for informal education). Therefore, students obtain these skills outside their universities (46%).

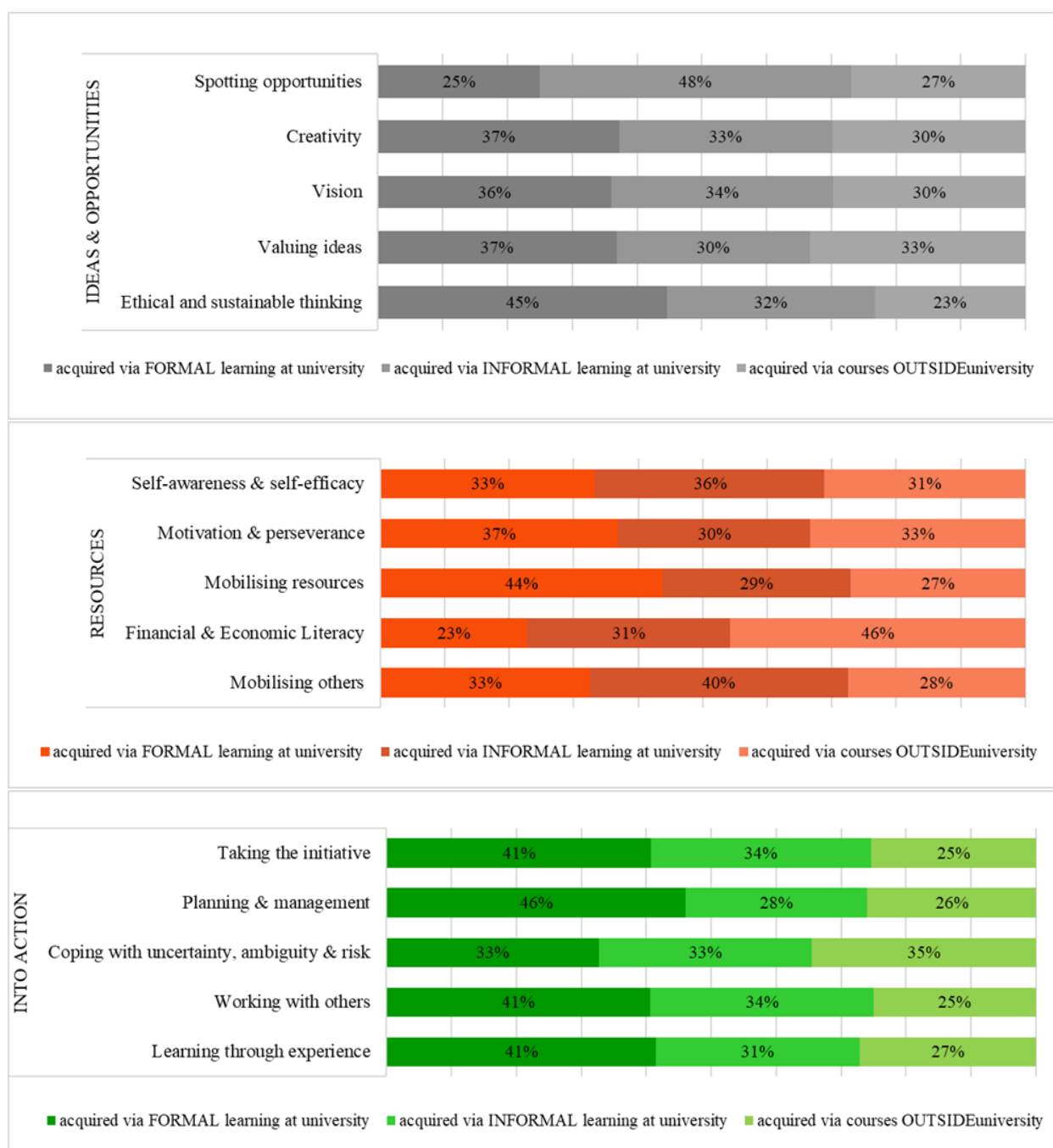


Figure 42. Entrepreneurship competencies and ways they are acquired by students in Ukraine

Students prefer digital instruments to learn entrepreneurship. 63% of students use Social Media Platforms (Youtube, Tik Tok, etc) to strengthen entrepreneurial skills, while 48% of students use MOOC platforms (e.g., Coursera, EdX) (see Fig. 43).

Books and articles are also popular among students as a source of knowledge on entrepreneurship (the choice of 57% of respondents).

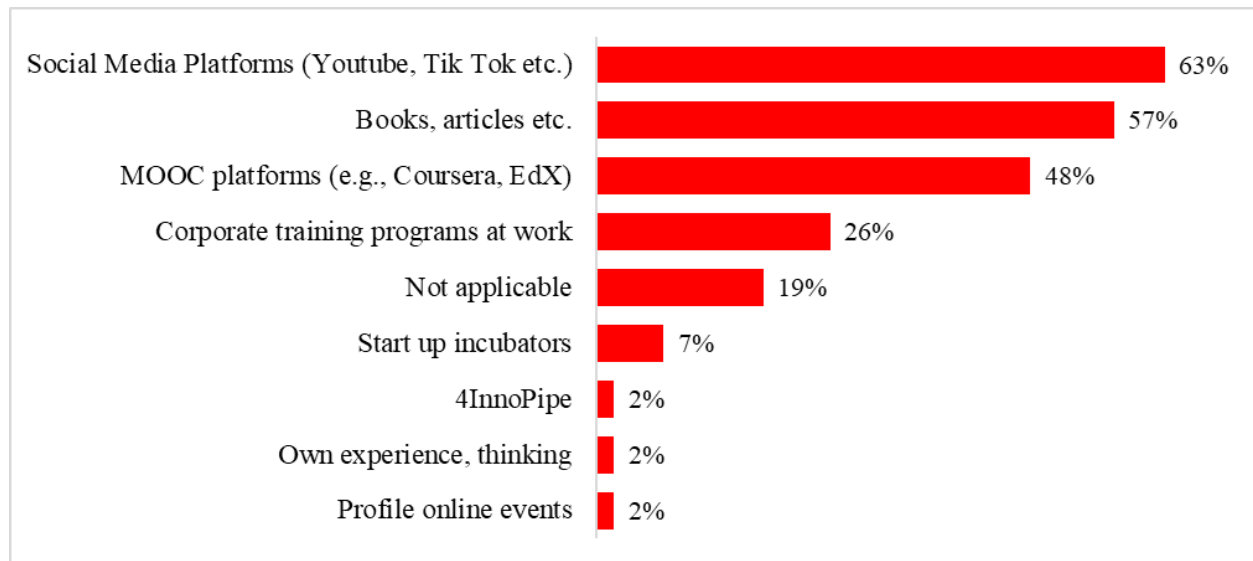


Figure 43. Platforms where students acquire entrepreneurship competencies

Figure 44 demonstrates the students' intentions for applying entrepreneurial skills: to start/run innovative business (Startup) - 65%, working in science and R&D - 63% and to start/run business (other than Startup) - 54%. These intentions emphasise the need for development of Startup and Prototyping infrastructure in HEIs. 43% of students are going to work in the corporate sector. 35% and 24% of respondents answered that they will apply their entrepreneurship competencies working respectively in the education sector and in public activities.

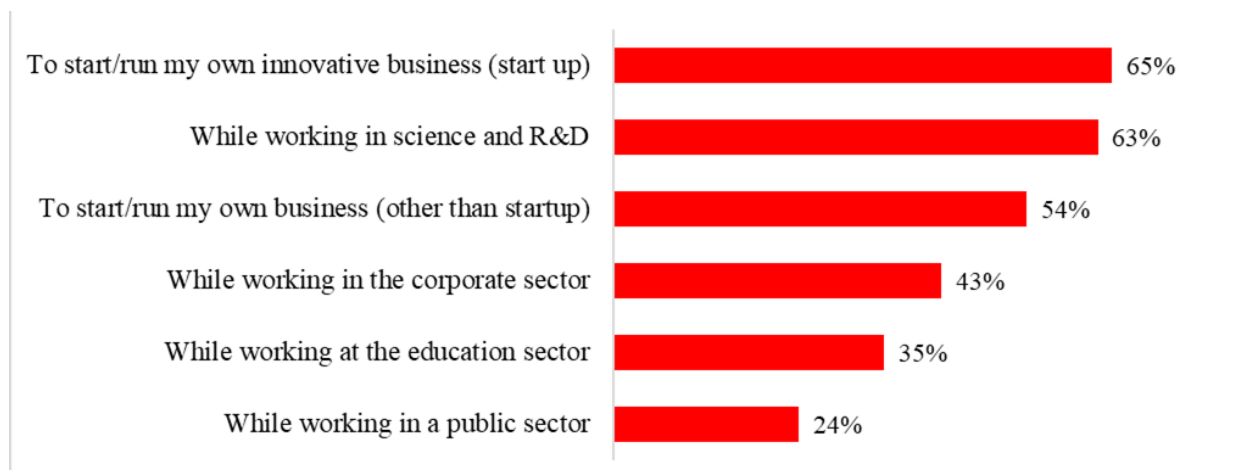


Figure 44. Students intentions to use their entrepreneurial competences

HEInnovate self-assessment

The results of the HEInnovate self-assessment are given in Figure 45. These are the averaged scores based on 14 answers of the universities academic, non-academic staff and students.

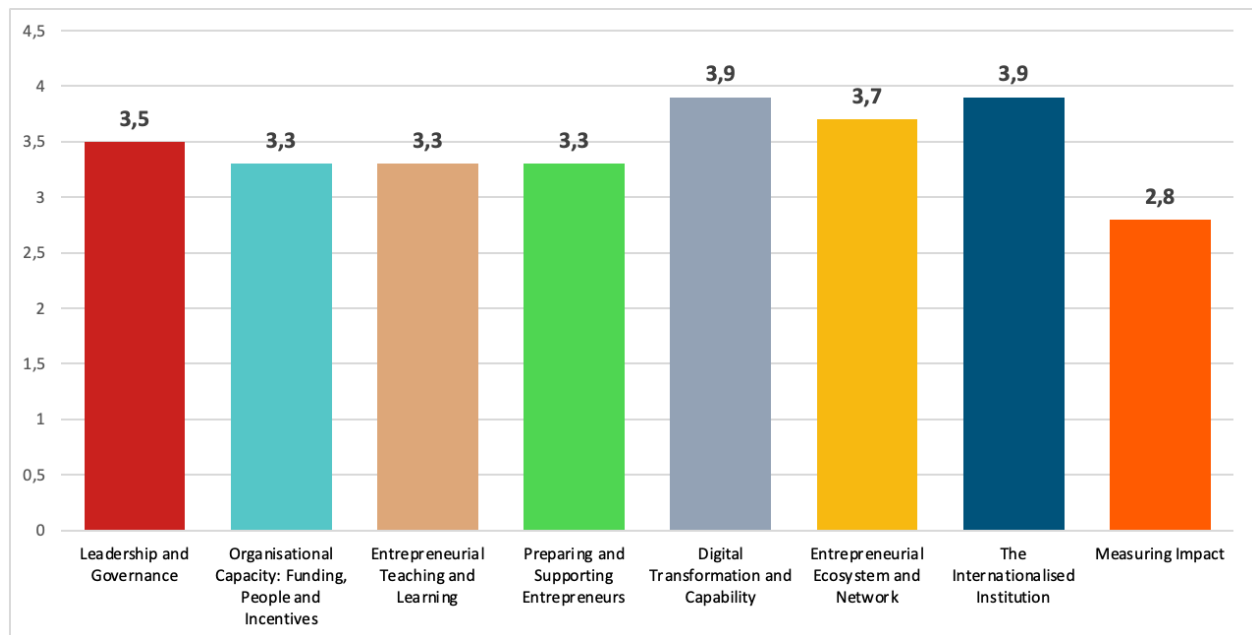


Figure 45. KAU HEInnovate self assessment

The results show that despite above average scores on all eight dimensions, KAU still has a lot to improve. The scores on entrepreneurship dimensions are as follows:

- Entrepreneurial Teaching and Learning - 3,3
- Preparing and Supporting Entrepreneurs - 3,3
- Entrepreneurial Ecosystem and Networks - 3,7

The details are provided in Figure 46.



Figure 46. KAU's HEInnovate entrepreneurial dimensions



KAU scores low on *entrepreneurial teaching and learning* (3,3). There is no formal entrepreneurial education at KAU, all its educational programmes are deep tech related. Nonetheless, understanding the importance of entrepreneurial knowledge and skills for innovations development and technology transfer, KAU is gradually working towards introducing informal learning opportunities for its students and staff. Incubation program “BOOSTER of innovative projects”, Entrepreneurial course “4InnoPipe”, separate modules on Business Modeling and Marketing are all part of the KAU’s informal education portfolio. KAU involves business mentors and other external stakeholders to design and deliver these courses. Despite all the efforts, these activities are often considered by students and staff as sporadic.

Highly experienced mentors of the Open Innovation Lab, Digital Innovation Hub NOSC-UA DIH, and Grant Office KAU are working on *preparing and supporting entrepreneurs*. They increase the awareness of students and staff on the importance of entrepreneurial skills, facilitate their ideas’ development, access to incubation programmes and funding. Though a lot of resources have now been used to improve these processes and there is substantial progress, the self assessment score on this dimension is not very high (3,3). It can be explained by the lack of funding to support such activities: universities in Ukraine in general and KAU in particular do not have a separate budget on supporting innovations, and they rely on external grant funding only. Additionally, for a more successful process, it would be beneficial to utilise project management tools and enhance the project management skills of the staff.

Relatively higher score (3,7) was reached on the *entrepreneurial ecosystem and networks dimension*. It means that the university is playing an active role in establishing partnerships with other ecosystem members. KAU implements research-based learning and is involving industry representatives to the process through Innovation Days, Hackathons and Summer schools. Business representatives are evaluating students’ projects within entrepreneurial courses. KAU demonstrates active involvement in partnerships with a wide range of stakeholders. KAU has strong relationships with local authorities (Kyiv City State Administration, Kyiv Region State Administration), and the National Academy of Sciences of Ukraine (NASU), cluster associations through the Ukrainian Cluster Alliance and a number of NGOs, aimed at supporting innovations. According to the self assessment, KAU lacks links with external incubators and science parks. The reason is quite objective. There are no operating science parks in Kyiv. While local incubators often avoid working with deep tech related projects due to the lack of sufficient expertise. That’s why KAU is currently working to launch the Academ.City Science park - the science park uniting 12 research institutes of the National Academy of Sciences of Ukraine (NASU). Meanwhile, KAU is partnering with Ukrainian Startup Fund - the public granting and incubation authority, to promote deep tech, dual-use and rebuilding technologies. In addition, the university establishes partnerships with European incubators and accelerators.

EIT HEI: An EU Perspective of the Entrepreneurial And Innovative University

One of the significant EU initiatives aimed at bolstering the entrepreneurial European landscape is the [EIT HEI Initiative](#). In the following section, we will present the objectives of the initiative, the methodology used and the results achieved so far.



Vision: The EIT HEI (European Institute of Innovation and Technology – Higher Education Institutions) Initiative envisions a transformative landscape where higher education institutions (HEIs) across Europe become vibrant hubs of innovation and entrepreneurship. This vision aligns with the overarching goal of invigorating Europe's economic and societal progress. By equipping HEIs with cutting-edge tools, expertise, and resources, the initiative strives to foster a culture of innovation, instill entrepreneurial mindset among students and graduates, and enhance the collaborative spirit between HEIs, businesses, and other stakeholders. As a key objective within the EIT's Strategic Innovation Agenda 2021–2027, the initiative holds the promise of propelling HEIs into positions of regional leadership and sustainable growth.

Objectives: The EIT HEI Initiative's multifaceted objectives are well-defined:

1. **Unlocking Innovation Potential:** At its core, the initiative seeks to unleash the untapped innovative potential residing within higher education institutions (HEIs) throughout Europe. By empowering HEIs to harness innovation, the initiative contributes to Europe's competitive edge on the global stage.
2. **Enhancing HEI Contributions:** The initiative is dedicated to providing robust support to HEIs in their quest to create new products, services, and businesses. This strategic support also extends to enhancing the quality of teaching and research, amplifying HEIs' positive impact on society.
3. **Cultivating Entrepreneurship and Innovation:** Fostering an environment where entrepreneurship and innovation thrive among students and graduates is central to the initiative's agenda. By nurturing this mindset, the initiative prepares future leaders to drive societal and economic change.
4. **Strengthening Collaboration:** Collaboration is paramount to innovation. The initiative aims to foster deep collaborations between HEIs, businesses, and stakeholders. Through these partnerships, the initiative aims to catalyze innovation, laying the foundation for sustainable growth and job creation across Europe.

Implementation - Roadmap for Progress: The EIT HEI Initiative's roadmap for progress encompasses several strategic components:

How the Initiative Works: Through its Innovation Capacity Building for Higher Education framework, the initiative offers HEIs a holistic approach to cultivating innovation. This includes expertise and coaching, access to the dynamic EIT innovation ecosystem, and essential funding. This comprehensive support empowers HEIs to design and implement innovation action plans tailored to their distinct needs.

Annual Calls for Proposals: An integral component of the initiative's operational structure is the annual calls for proposals. These calls extend invitations to European higher education institutions, inviting them to devise institution-wide action plans aimed at fortifying their entrepreneurial and innovation capabilities at all levels. By nurturing these activities, the initiative catalyzes systemic change, enabling HEIs to evolve into regional innovation powerhouses.



Eligible Participants and Themes: The Calls for Proposals encompass a diverse array of eligible participants, including higher education institutions (one of which must be a KIC partner), public bodies at various administrative tiers, enterprises of varying scales, intermediary organizations representing HEIs, research institutions, and Horizon Europe countries. Projects can focus on an array of themes, encompassing institutional engagement, collaborative partnerships, innovation and business support services, entrepreneurial education enhancement, and knowledge generation and dissemination.

Participating in the HEI Initiative offers a range of valuable opportunities:

- Enhance your organization's entrepreneurial and innovation capacity.
- Expand your network by joining the ever-growing community of 290 Higher Education Institutions (HEIs) already engaged in the HEI Initiative.
- Gain access to the knowledge and resources provided by Knowledge and Innovation Communities (KICs), supported by the European Institute of Innovation and Technologies.
- Forge stronger connections within your innovation ecosystem.

Moreover, successful projects within the initiative receive additional support to advance their endeavors:

- **IVAP Development Workshop:** This event serves as the launchpad for recently approved projects. It facilitates testimonials, knowledge exchange, and networking, fostering a sense of community among HEI Initiative projects. The workshop features participation from KIC representatives, the EIT, the European Commission, and prior approved projects. Typically held in-person annually, all approved projects are encouraged to attend.
- **Co-Creation Workshop:** Delving into the domains of action underpinning the HEI Initiative, this workshop engages participants through expert roundtables and insights from successful HEI Initiative projects. It also provides a platform for discussing project implementation and future avenues for collaboration. This workshop is conducted online and tailored to projects in both phases of implementation.
- **KIC Showcase Event:** This public event mobilizes the KIC network to spotlight projects and programs that bolster innovation and entrepreneurship. The focus centers on sharing best practices and strategies for scaling and replication. The event is organized online on an annual basis.
- **Sense-Making Workshop:** Designed for projects in their second phase, this workshop aims to reflect on project achievements, identifying strengths and areas for improvement across the HEI portfolio. It usually convenes in-person, engaging project representatives and HEI Project officers. All approved projects are encouraged to participate.
- **Training Course on System Innovation:** For projects in their second phase, this training equips them with the tools to analyze their innovation ecosystems and establish stronger connections. The training is conducted online, catering to projects in Phase 2.



Shared Vision: The EIT HEI Initiative resonates deeply with broader European structures and programs, aligning harmoniously with the New European Innovation Agenda. This concerted vision is designed to foster, attract, and retain deep tech talents, crucial for Europe's successful navigation of the green and digital transitions. By positioning Europe as a focal point within the global innovation ecosystem, the initiative complements and amplifies the collective efforts towards transformative change.

A Pathway to Progress: The EIT HEI Initiative epitomizes the European Union's commitment to nurturing higher education institutions' innovation capacities. By facilitating access to funding, offering expert insights, and providing coaching, the initiative empowers HEIs to craft and execute innovation action plans. This transformative journey elevates HEIs' competitiveness, furthering Europe's social and economic advancement.

Envisioning a Bright Future: Participating in the EIT HEI Initiative promises a host of benefits for higher education institutions. These include not only access to funding but also exposure to expert insights, coaching, networking opportunities, and enhanced visibility. By engaging with the initiative, HEIs can play a vital role in shaping Europe's innovation landscape. As they develop and implement innovation action plans, HEIs contribute to economic growth, sustainable development, and a future brimming with possibilities.

3. The Transformation Roadmaps to 2025

3.1. Technical University of Varna (TUV)

TUV's transformation is defined by its positioning as a major Bulgarian regional provider of training and education in various key engineering fields. Key aspects include:

- TUV innovation and entrepreneurship support activities target all engineering fields covered by the university, with emphasis on those included in the national and regional smart specializations.
- TUV ecosystem and networking activities are internationally focused where various measures will be taken to improve communication and engagement.
- TUV will act to improve internal structures and mechanisms in order to better support entrepreneurs.



Figure 47 presents the set of actions within three dimensions for TUV, defining the impact for each action and their timeframes.

Entrepreneurial Teaching and Learning <i>Developing formal and informal learning courses, based on entrepreneurship research and stakeholders' dialogue</i>			
GAPS	- Unstructured formal teaching – bachelor and master programs have courses related to entrepreneurship, but do not have complete coverage. - Not all engineering courses include entrepreneurship training - Course structure and content does not meet students' expectations - Lack of digital training materials in entrepreneurship		
ACTIONS	Actions	Impact	Timeframe
	A1. Better identify entrepreneurial education needs and obstacles.	High	Medium
	A2. Designing and delivering structured and improved entrepreneurship courses.	High	Medium
	A3. Intensify the usage of digital training materials – including social media and MOOC.	Medium	Medium
	A4. Communicate the importance of entrepreneurship training to faculties and departments in order to achieve better integration in all engineering courses.	High	Medium
	A5. Extend the number of entrepreneurship speaker events (public lectures, podcasts)	High	Medium
OUTCOME	- Increased curriculum quality based on students' and staff needs and current trends - Increase the number of students engaged in entrepreneurship training - Formal entrepreneurial opportunities provided		



Preparing and Supporting Entrepreneurs <i>Assisting students and staff in developing entrepreneurial ideas through mentoring and facilitating access to incubating and funding</i>			
GAPS	• Lack of efficient structure for support of entrepreneurs • No mechanisms at the university for funding start-ups • Lack of entrepreneurial and innovation culture		
ACTIONS	Actions	Impact	Timeframe
	A1. Develop a new structure within the university to support entrepreneurs and start-ups.	High	Short
	A2. Produce feasibility studies and develop scenarios for attraction of funds and using own funds to support student and academic start-ups and business ventures.	High	Long
	A3. Implement courses for academic and non-academic staff in order to improve their capacity for support of students that aim to develop their own start-up or business venture.	High	Short
	A4. Delivering short-term courses on deep tech science for entrepreneurs.	High	Medium
OUTCOME	• Better support structure and possibility to fund student start-ups • Improved capacity for entrepreneur support		



Entrepreneurial Ecosystem and Network <i>Integration and collaboration with external stakeholders and entrepreneurial ecosystem players</i>			
GAPS	- There is no mechanism to follow the development of students after their graduation and record their progress in start-up development - Ineffective communication within between the University and the local ecosystem - Reduced awareness generated by the University - Entrepreneurs might not be aware of available resources, and stakeholders may miss opportunities to support promising ventures.		
	ACTIONS	Impact	Timeframe
	A1. Develop better awareness rising programs for possibilities in the field of entrepreneurship within the University	Medium	Short
	A2. Organise events and meetings for improving networking and communication	Medium	Medium
	A3. Develop a registry of students with successful start-ups – monitor their progress and invite them to hold inspirational lectures and presentation	Medium	Long
OUTCOME	- More cooperation - Improved communication		

Impact: L (low), M (medium), H (high)

Timeframe: S (short-term, 1 year), M (medium-term, 2-3 years), L (long-term, 4-5 years)

Figure 47. Transformation Roadmap for TUV.



3.2. The Arctic University of Norway (UiT)

The UiT The Arctic University of Norway is recognized as a leading institution in polar science research. This role carries a significant responsibility, given the university's geographical location, which is at the forefront of witnessing the impacts of climate change. Since its establishment, UiT has been diligently working to support both its student body and the broader society in addressing issues related to sustainable development. This initiative necessitates fostering a new entrepreneurial mindset to navigate the challenges and opportunities that lie ahead in promoting sustainability. Through a collaborative approach, the university strives to generate meaningful insights and solutions that are crucial in this era of environmental consciousness and transformation.

UiT's Roadmap is based on the following facts:

- The UiT The Arctic University of Norway is dedicated to advancing external programs within the domain of regional and international partnerships, focusing on bolstering entrepreneurial competencies and assessing the impact of the undertaken activities.
- UiT has exhibited remarkable performance across all facets of HEInnovate's entrepreneurship arenas, valuing each dimension equally in fostering a high-caliber entrepreneurial environment within the institution. The university embodies a culture of excellence and relentless refinement aimed at magnifying its entrepreneurial influence on a global scale.
- As a vanguard in this field, UiT is poised to serve as a mentor and guide for other Higher Education Institutions (HEIs) aspiring to augment their entrepreneurial capacities, thereby fostering a collaborative ecosystem of progressive learning and innovation in entrepreneurial endeavors.

UiT holds a steadfast commitment to its entrepreneurial vision, acknowledging that despite the entrepreneurial milestones achieved, there remains an endless scope for enhancement. The following (Fig. 48) are the actions that SEEDplus team suggests to improve the role and ecosystem around UiT.



Entrepreneurial Teaching and Learning <i>Developing formal and informal learning courses, based on entrepreneurship research and stakeholders' dialogue</i>			
GAPS	• The current curriculum may not provide enough practical or experiential learning opportunities for students to develop an entrepreneurial mindset and competencies. • The curriculum might lack a robust framework for exploring the social and societal impacts of entrepreneurial endeavors. • The lack of dedicated degree programs in entrepreneurship might hinder the students' ability to delve deeper into entrepreneurial theories and practices • The absence of project-based entrepreneurship degree programs with a focus on experiential learning might impede the practical application of entrepreneurial knowledge..		
ACTIONS	Actions	Impact	Timeframe
	A1. Adopt curriculum in a way to support students to experience and gain entrepreneurial mindset and competences.	High	Medium
	A2. Involve the topic of social and societal impact to the curriculum.	High	Medium
	A3. Establish taught degree programmes for entrepreneurship.	High	Long
	A4. Introduce project-based entrepreneurship degree programmes that include experiential learning.	High	Long
OUTCOME	• Students can cultivate an entrepreneurial mindset and competencies which are essential for real-world challenges. • Introducing topics related to social and societal impact will foster a sense of responsibility and awareness among students regarding the broader implications of entrepreneurial activities. • Establishing dedicated degree programs for entrepreneurship will provide a structured learning pathway for students keen on pursuing entrepreneurship as a career. • Bridging the gap between theoretical knowledge and practical application, thereby enriching the entrepreneurial learning experience.		



Preparing and Supporting Entrepreneurs <i>Assisting students and staff in developing entrepreneurial ideas through mentoring and facilitating access to incubating and funding</i>			
GAPS	- Nascent startups may struggle due to the lack of personalized coaching and mentoring, which could lead to avoidable mistakes and hindered growth. - Promising startups may lack structured acceleration programs which could slow down their progress and affect their potential success. - Startups may face challenges in networking and connecting with relevant stakeholders, investors, public funding sources, and experienced alumni, which can limit their opportunities for growth and support. - The absence of active matchmaking between startups, investors, established companies, and experts might delay the collaboration and investment opportunities for startups. - The absence of direct startup investment channels through a venture capital (VC) fund or specialized services might hinder the startups' financial capacity to scale and thrive.		
ACTIONS	Actions A1. Provide individual coaching and mentoring support for nascent start-ups. A2. Set up cohort-based start-up acceleration programmes for promising start-ups. A3. Facilitate connections to relevant stakeholders, investors, public funding sources and experienced alumni. A4. Engage in active matchmaking between start-ups, investors, established companies and experts. A5. Create specialised matching events. A6. Establish a means of direct start-up investments via own venture capital (VC) fund or by providing specialised services.	Impact High High Medium Medium High Medium	Timeframe Short Medium Medium Short Medium Long
OUTCOME	- Providing individual coaching and mentoring support will empower nascent startups with personalized guidance, helping them to navigate challenges and grow effectively. - Establishing cohort-based startup acceleration programs will provide a structured support system for promising startups, aiding them in refining their business models and accelerating their growth.		



- By facilitating connections to relevant stakeholders, investors, public funding sources, and experienced alumni, startups can access a network of support and resources essential for their success.
- Engaging in active matchmaking between startups, investors, established companies, and experts can lead to fruitful collaborations, investment opportunities, and a wealth of shared knowledge and expertise.
- Creating specialized matching events will provide a platform for startups to meet with potential investors, mentors, and partners, thus fostering an ecosystem of collaboration and support.
- Establishing a means of direct startup investments through a VC fund or by providing specialized services will create a robust financial support system for startups, enabling them to secure the necessary funding to scale and succeed.

Entrepreneurial Ecosystem and Network

Integration and collaboration with external stakeholders and entrepreneurial ecosystem players

GAPS

- Lack of real-world entrepreneurial exposure and relevancy in research due to limited collaboration with industry partners.
- Insufficient engagement with public stakeholders, local actors, and broader entrepreneurial networks, hindering a comprehensive entrepreneurial ecosystem.
- Absence of a conducive environment for commercialising research activities and fostering local innovation.
- Insufficiency in dedicated entrepreneurship research activities and structured groups to promote entrepreneurial scholarship.

ACTIONS

Actions

Impact

Timeframe

A1. Use industry collaborations to provide students with relevant current (and future) entrepreneurial opportunities.

High

Medium

A2. Ensure the relevance of ongoing research and open up new research directions by closely collaborating with industry partners.

High

Medium

A3. Extend collaboration efforts to public stakeholders and local actors within the entrepreneurial ecosystem.

High

Medium

A4. Establish a science cluster or science park to boost the commercialisation of research activities and foster a local ecosystem of innovators.

Medium

Long



	A5. Engage with the public and local community through accessible and open formats.	High	Short
	A6. Join an existing network such as HEInnovate to benefit from collective expertise in the field.	High	Short
	A7. Act as a trusted market intermediary and engage in matchmaking activities between the different stakeholders within the ecosystem.	Medium	Medium
	A8. Build an active network including the different stakeholders and act as an enabler of living labs to initiate transformational entrepreneurship processes.	High	Long
	A9. Offer interactive, sequential formats to initiate entrepreneurial projects and co-creation involving stakeholders as interactive partners.	High	Medium
	A10. Establish and incentivise entrepreneurship research activities at UiT.	High	Short
	A11. Establish a formal entrepreneurship research group that jointly engages in research and has access to joint funding.	High	Long
OUTCOME	• Fosters real-world entrepreneurial exposure for students and ensures the relevance and expansion of research directions through close industry partnerships. • Enhances collaborative efforts with public stakeholders and local actors, establishes a science cluster or park to boost research commercialisation, and engages with the local community, creating a vibrant local ecosystem of innovators. • Joining networks like HEInnovate, acting as a market intermediary, and building active networks with stakeholders will facilitate matchmaking and living labs, fostering transformational entrepreneurship processes. • Offering interactive formats for entrepreneurial projects, incentivising entrepreneurship research, and establishing a formal research group will propel entrepreneurial scholarship and co-creation, enriching the entrepreneurial ecosystem at UiT.		

Figure 48. Transformation Roadmap for UiT.

3.3. Kyiv Academic University KAU

Roadmap

KAU's transformation is defined by its positioning as a research university and its main approach - "Learning by doing research internationally":



- KAU innovation and entrepreneurship support activities target all the innovation creation chain, starting with the lowest levels of TRL and covering among others the fundamental research projects.
- KAU ecosystem and networking activities are internationally focused and are aimed to ensure integration into the European educational, research and innovation areas, utilise international incubation and financing opportunities.
- KAU innovation projects are aimed at solving local and global challenges in the frame of interconnected innovation ecosystems.

Figure 49 presents the set of actions within three dimensions for KAU, defining the impact for each action and their timeframes.

Entrepreneurial Teaching and Learning <i>Developing formal and informal learning courses, based on entrepreneurship research and stakeholders' dialogue</i>			
GAPS	• Limited formal learning opportunities • Lack of technology, entrepreneurship and macro trends research integration into the entrepreneurship edu • Course structure and content does not meet students' expectations		
ACTIONS	Actions	Impact	Timeframe
	A1. Annual monitoring of the technology market environment and trends by KAU Think Tank to develop short-term informal courses, addressing the current needs.	High	Medium
	A2. Entrepreneurial learning validation approach and procedure developed and implemented by Innovation Center KAU.	High	Medium
	A3. Launching the formal entrepreneurial educational practical-based program for the Second (Master) level.	High	Medium
	A4. Conducting a focus group with academic staff to identify their entrepreneurial education needs and obstacles.	High	Medium
	A5. Designing and delivering English language courses, e.g. English for Innovations, PM English, Business English.	Medium High	Short Medium



	A6. Extend the number of entrepreneurship speaker events (public lectures, podcasts)	High	Medium
OUTCOME	- Increased curriculum quality based on students' and staff needs and current trends - Formal entrepreneurial opportunities provided		

Preparing and Supporting Entrepreneurs <i>Assisting students and staff in developing entrepreneurial ideas through mentoring and facilitating access to incubating and funding</i>			
GAPS	- Lack of public funding - Lack of project management tools and skills - Low capacity of Innovation Centre KAU - Low level of communication and recognition of the science-business cooperation efforts / entrepreneurial thinking / putting entrepreneurial knowledge to work - Lack of entrepreneurial and innovation culture		
ACTIONS	Actions	Impact	Timeframe
	A1. Project management automation (preliminary, with Jira tools).	High	Short
	A2. Introducing a Science-Business Cooperation Award for staff and their nomination for external awards.	Medium	Medium
	A3. Internal team building activities to foster cooperation of academic staff and Innovation Center KAU.	High	Short
	A4. "Train the Trainers" program from partner institutions and experts in innovation brokerage and management.	High	Medium
	A5. Launching a certificate program on Project Management for Science and Innovation.	High	Long
	A6. Delivering short-term courses on deep tech science for entrepreneurs.	High	Short
	A7. Applying for grants to ensure further innovation support activities and the sustainability of the Entrepreneurial Hub.	High	Long



	A8. Activation of the efforts in regional smart-specialisation and entrepreneurial discovery: participating in brokerage events, Smart-specialisation events, launching a Smart-specialisation (City Acceleration Programme with Kyiv City State Administration).	High	Long
	A9. Organising match-making events with the Ukrainian Cluster alliance.	High	Short
OUTCOME	- Better project management skills of students and staff - Higher innovation department capacity through automation - Better access to incubation and funding through wider science-business contacts - Improved entrepreneurial thinking, entrepreneurial and innovation culture		

Entrepreneurial Ecosystem and Network <i>Integration and collaboration with external stakeholders and entrepreneurial ecosystem players</i>			
GAPS	- External partnerships being large in quantity are non-formalised, rather declarative in character, without defined actions and KPIs. - A quadruple-helix project Science park "Academ.City" is developing very slowly		
ACTIONS	Actions	Impact	Timeframe
		Medium	Medium



	A1. Cooperation with Ukrainian Startup Fund on technical mentoring and co-organised startup events.	Medium	Medium
	A2. Cooperation with Kyiv National University Science Park, Kyiv National Economic University Science park, and Lvivska Politechnika Science Park (signing memorandums, launching joint initiatives).	Medium	Short
	A3. Active participation in the implementation of regional smart-specialisation strategy and presenting KAU's projects at regional innovation events.	High	Short
	A4. Signing agreements with existing contacts to formalise cooperation and set joint objectives and actions.	Medium	Medium
	A5. Plan joint activities of the Entrepreneurial HUBs of KAU, UiT, and TUV.		
OUTCOME	More structured, objectives-led cooperation with ecosystem stakeholders to support KAU's entrepreneurial ecosystem and the "Academ.City" Science park establishment.		

Timeframe: (short-term, 1 year), (medium-term, 2-3 years), (long-term, 4-5 years)

Figure 49. Transformation Roadmap for KAU.

3.4. Synergies

Amidst the distinct actions embarked upon by each partner university, we've recognized collaborative synergy activities, which serve as an extension to those initially delineated within the SEEDplus project. These activities particularly pertain to domains where certain universities have exhibited a remarkable performance relative to their partners, as indicated by the HEInnovate self-assessment (refer to Fig. 50). Although the SEEDplus project delineates several activities, it's noteworthy that some, as depicted in the figure, are the accomplishments of the dedicated SEEDplus team. Additionally, the engagement of G-Force and Fasttrack teams—acknowledged for their expertise in startup acceleration and venture investing—is anticipated to substantially contribute to augmenting the entrepreneurial capacity of TUV, UiT, and KAU.

The SEEDplus project is a significant component of a larger endeavor, namely the CloudEARTH initiative, which is devoted to empowering European Higher Education Institutes (HEIs), transforming them into catalysts for change. Currently active across 12 European countries, the CloudEARTH initiative boasts a partnership with 23 diverse entities, comprehensively covering a majority of stakeholders as illustrated in Fig. 51. SEEDplus serves



as the strategic fulcrum for the CloudEARTH*i* team, furnishing the requisite strategy for the ensuing years aimed at societal transformation towards a more circular, greener, and sustainable paradigm. CloudEARTH*i* is structured around five key pillars: educational programs, research, communication, dissemination and exploitation unit, informed decision-making, alongside incubation and acceleration services. This robust structure is further reinforced by the presence of two innovation labs situated at TUV and the University of Applied Sciences of Burgenland, a technology transfer office at KAU, and an information office at Alicante University.



Figure 50. [Synergy activities of the Transformation Roadmaps.](#)

The report at hand is perceived as a pivotal linkage, harmonizing the aforementioned five pillars, facilitating a cohesive operational mechanism amongst the 23 participating institutes within the initiative. While the report proposes actions at an institutional level primarily targeting three institutes (i.e., UiT, KAU, and TUV), it's imperative to note that the actual implementation of these propositions will transpire at the broader level of the CloudEARTH*i* initiative, encompassing all 23 institutes (refer to Fig. 51). This approach is envisioned to significantly amplify the impact, ensuring a seamless integration and execution of proposed



actions, thereby fostering a culture of collaborative innovation and sustainable practice across the institutions.

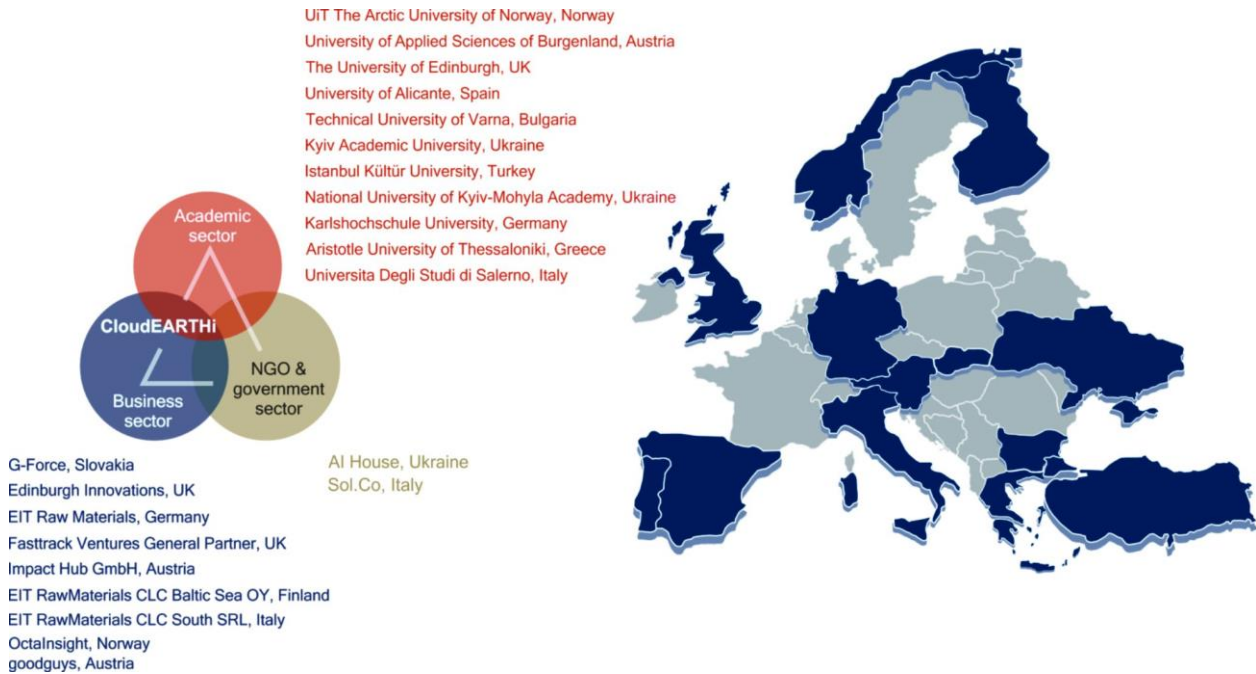


Figure 51. A map showing the distribution of CloudEARTH consortium in 12 European countries. The partners represent the knowledge triangle by academic institutes, NGOs and business partners.