EIT HEI Initiative

Innovation Capacity Building for Higher Education

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D2.2 Framework institutional capacity building in NOBALIS

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Executive Summary

To select the policies that the consortium considers most relevant to develop, the work was started with a survey of which policies and guidelines the participating HEIs work under today. The survey was conducted including both national and institutional level in all the participating countries.
An overview of the documents identified follows as Appendix 1.

Throughout the course of the project, the participants uncovered several areas in which one or more of the participating institutions lacked policy. Based on this, the consortium jointly selected the following areas for which policy has been prepared:

- Secondary positions.
- Merit for innovation.
- Students in innovation projects.
- Participation of non-academics/technical personnel in start-ups/Innovation projects.

The consortium has developed policies for each of the areas based on practices either inside the consortium, or from other outside HEIs. Resulting in policies and guidelines for how the university can facilitate secondary positions and academic entrepreneurship; suggestions on guidelines for how academic staff can receive merit for innovation and entrepreneurial works in addition to teaching and research; policies for implementing and supporting student innovation both through credits, and extracurricular activities; guidelines for administrative and technical staff in innovation projects. The report also includes an overview over funding opportunities for students, researchers, and start-ups, as well as financial incentives to promote innovation and entrepreneurial activities, and suggests innovation leave for researchers to peruse commercialization and utilization of their research results. The deliverable also includes guidelines for how to assess the innovation maturity and implementation.

In addition, a great deal of relevant experience and exchange of views has been discussed related to the various legal basis for the work between Sweden and the other participating countries. The consequences of Sweden retaining the professors' privilege while the other countries have removed it from their legislation have been discussed in several meetings, but there is currently insufficient basis to reach any unambiguous conclusion as to which scheme is most effective for innovation and commercialization work. This is mainly because there are also many other factors that influence whether an institution is active in this work or not. The degree of maturity for innovation work varies among the participating institutions, and the discussions and exchanges of experience that arose around this issue are in themselves an important step for many of the participants in further policy development.

About the EIT HEI Initiative

The EIT HEI Initiative: Innovation Capacity Building for Higher Education has been designed with the aim of increasing the innovation and entrepreneurial capacity in higher education by bringing together HEIs in innovation value chains and ecosystems across Europe. A central philosophy of the EIT is the integration of the EIT Knowledge Triangle Model into all its activities. HEIs selected to participate in the HEI Initiative will also leverage and use the Knowledge Triangle Model as an enabler, facilitating the creation of systemic, institutional change. Additionally, HEIs selected to participate in the HEI Initiative will contribute to and leverage Smart Specialization Strategies, the Regional Innovation Impact Assessment (RIIA) Framework, as well as align to the goals of the EIT Regional Innovation Scheme (EIT RIS). This will strengthen the links between HEIs and their local and regional ecosystems and provide an impetus to leverage additional funding sources beyond the HEI project funding period of the selected HEI projects. HEIs are encouraged to prepare applications which will support the development and implementation of six Actions in their institutions, cumulatively leading to institutional transformation, an increase in entrepreneurial and innovation capacity, and integration with innovation ecosystems.

Overview existing policies.

Before creating new policies, we started with a survey of which policies and guidelines the various universities work under today and shared the policies amongst all the participants. Example of these type of documents and policies are university laws, copy right acts, strategy documents and governmental platforms. We created an excel spreadsheet to serve as a database where we linked to the policy documents, sorted them by country, institution, status (implemented, in progress, or missing), and policy level (national, institutional level). Additionally we used the categories from Deliverable D2.1 Roadmap to improve and exchange innovation capacity and innovation systems and structures to show which parts of the ecosystem they affect. The categories were as follows:

- Networking and idea generation events
- Formal education
- Industry education
- Co-working spaces
- Incubator and accelerators
- Advisory services and mentors
- Funding
- Prototyping
- Commercialization

in total the consortium went through 85 policy documents from the participating HEIs, national policies and laws, or other universities policies. The full list of policies reviewed can be seen in Annex 1: reviewed policy documents.

In the table below we have gathered the policies the consortium defines as central for innovation to take place in the universities. "X" have been used to mark if it is present, while "(X)" is used, but not clearly described.

Table 1: Key policies and structures for innovation

Policy or framework	LNU	SLU	NMBU	EMU	LBTU
Innovation and entrepreneurship described in the institutions strategy	X	(X)	X	X	X
Universities third mission stated in law	X	X	X	X	
Developed intellectual property laws	X	X	X	X	X
General guidelines for intellectual property rights in the University	X	X	X	X	X
Technology/knowledge transfer office/Holding company	X	X	X	X	X
Access to capital for innovation	X	X	X	X	X

Four of the universities as of 2023 have innovation included as a main topic in their strategies and development plans and all consider partaking in economic development one of many tasks the universities should take part in.

Key legal difference in Sweden

There is one big legal difference that is affecting the policies and frameworks for innovation in the consortium. Sweden has what's called professors privilege which means that academic staff at Swedish universities are exempt of the a "employee inventions act" and generally own the results of their work results unless otherwise agreed. In Estonia, Latvia, and Norway the employer has the rights to the work results. This law affects the universities through their structures and polices. The Swedish universities do not have typical technology or knowledge transfer office, but rather have innovation offices or Holding companies attached to them. The holding companies are state own limited liability companies that assists researchers when commercializing their results. They operate by investing early in the spin-off companies. In Estonia, Latvia, and Norway the commercialization is being done utilizing the technology/knowledge transfer office where the inventor receives compensation.

This difference became a point of great discussion where experiences in both legal systems were shared. The consequences of Sweden retaining the professors' privilege while the other countries have removed it from their legislation have been discussed in several meetings, but there is currently insufficient basis to reach any unambiguous conclusion as to which scheme is most effective for innovation and commercialization work. This is mainly because there are also many other factors that influence whether an institution is active in this work or not. The degree of maturity for innovation work varies among the participating institutions, and the discussions and exchanges of experience that arose around this issue are in themselves an important step for many of the participants in further policy development.

All the universities promote and supports innovation and has a general overlap of policies. Through the course of the projects the participants uncovered several areas in which one or more of the participating institutions lacked polices. Based on this the consortium jointly selected the following areas for which policy has been prepared.

Assessment of universities level of innovation and entrepreneurial culture Or Innovation Readiness

Universities in Europe, in general, have a considerable degree of autonomy in academic and other matters. While there may be some level of government oversight or regulation, universities typically have the authority to manage their internal affairs independently. Universities prioritize research and education because these are core components of their mission to generate knowledge and educate future generations. The question of how to transfer the academic knowledge into utilization and innovations is a bit complex. Overall, the complexity of working with utilization or commercialization as a researcher, staff member or student at a university stem from institutional barriers, resource constraints, cultural norms, and the inherent challenges of bridging the gap between

academic research and practical applications in the marketplace. Overcoming these challenges requires concerted efforts to streamline processes, enhance support services, foster interdisciplinary collaboration, incentivize entrepreneurial activities, and cultivate a culture of innovation and entrepreneurship. This culture is also essential for producing groundbreaking research, fostering technological advancements, and facilitating the transition of academic knowledge into real-world applications and startups.

Below we would like to propose a model for assessment of universities level of maturity of innovation and entrepreneurial culture. It should be seen as a tool for comparing the innovation readiness level between different universities. The higher points reached the better opportunities for taking care of innovative research and transfer knowledge to the society. The persons doing the assessment are either people from the academic innovation system or experts from the national innovation agency or similar.

Table 2: Assessment tool for maturity of innovation and entrepreneurial culture

Statements	1	2	3	4	5
HEI have well working Knowledge Transfer and IP Policies	3	5	3	1.5	3
Students and staff have access to trainings in innovation and entrepreneurial development.	4	3.5	4	2.3	4
Innovation and entrepreneurship is a major part in HEI's strategy.	2.5	5	4	2	2
Innovation and entrepreneurial objectives (KTO targets) are supported by a 'wide range of sustainable funding and investment sources.	3	2	1	2	2
There is a model and a physical or digital platform for coordinating and integrating innovation and entrepreneurial activities across the HEI.	2.5	4	1	1.8	4
HEI Management involved in KTO that encourages and supports faculties and units to act for innovation and entrepreneurial work and sideline activities.	3	3	3	1.8	3
Utilization/innovation work and sideline activities are beneficial when staff applying for higher appointments and in assessment for salary.	1	1	3	2	3
The HEI integrates research, education, and industry (wider community) activities to exploit new knowledge.	3.5	4	4	2.7	3
The HEI is committed to collaboration and knowledge exchange with industry, the public sector and society.	4	4	4	2.8	3
The HEI is a driving force for entrepreneurship and innovation in regional, social and community development.	2.5	3	3	2	2
The HEI regularly assesses the impact of its entrepreneurial agenda.	1.5	5	3	1.8	2
Internationalization is an integral part of the HEIs entrepreneurial agenda.	4	2	3	1.7	2

Summary:	34.5	41.5	37	24.4	33

The statements have been designed to where the participant can rate with points from 1 to 5. Where 1 is does not work I practice, 3 is implemented and in practice, and 5 works very well in practice. After finalizing the test, we could see that it was a quite large spread of points depending on the innovation work of the different universities. We also made a conclusion that the answers could be biased since some questions covered more than one aspect to assess e.g. HEI have well working Knowledge transfer and IP policies. This led to a revised tool in Appendix 3 that contains some extra and more specific questions.

Secondary position.

The researcher or inventor is often needed for the research results to become innovations or spin-off companies. The knowledge, both tacit and explicit is important during commercialization and puts both the institution and the researchers in a position where there is a need for them in two different roles. On one hand the university wants to continue to create new knowledge and development on the subject, while at the same time the university and society also wants the knowledge to result in economic activities. This develops the need for the researchers to have two different roles where one of them is in their private company. Therefore, guidelines for secondary positions for how this is handled is important to make it clear for the institution, and the individual.

The NOBALIS consortium suggest that a routine for sideline jobs is created in accordance with the labor laws the HEI operates in. Using an example developed by Senior Advisor Kristine Dehli Høitomt for the employees at one of the faculties at NMBU we have created general guidelines for how this can be done and implemented. These guidelines are relevant for employees that develop startup companies in parallel with their position at the university.

Sideline jobs must be stated as a positive but crucial question in the employment contract and be communicated to staff when recruited – this is the employer's responsibility. Since long time may pass between when the staff has been hired and the time for secondary positions there should be communication around this matter on a regular basis and in an encouraging way.

- Employees must on their own initiative notify their employer of sideline jobs. External work that may lead to conflict of interest requires approval from your immediate superior. This is to reduce possibility of conflict of interest such as impartiality and working hours. An example of operationalization of this could be to have a registration scheme for employees' external work.
- The immediate manager approves the sideline job with assistance from human resources in case there could be a conflict of interest.
- Questions surrounding intellectual property rights should be assessed by a legal representative at the institution.

- If the sideline job utilizes university owned resources or infrastructure there should be a written agreement containing how resources and infrastructure can be utilized, and how long.
- We recommend annual dialog between the employee and manager. This creates an opportunity to make plans for how the sideline job can be combined with the main position of the employee. It also serves to check if there is a need for new assessment of conflict of interest.

Not everything needs to be approved and registered. The NOBALIS consortium recommends the following as examples on sideline jobs that should be approved:

- Work that disables you from work during normal working hours.
- Is of long term or extensive nature
- Involves use of the HEIs resources
- Work that may lead to confusion of your/the clients and the HEIs interest and resources.
- Work that can lead to competition with the HEIs activities.
- Work that may lead to doubt in your impartiality.

Merit for innovation.

For academics to take part in innovation activities have a lot of upsides, both for the academic themselves but also for the HEI. It provides new collaborations and networking opportunities, its often interdisciplinary or cross sectoral, and provides opportunities to learn new skills and practical experience that can carry over to the research. It also opens for more funding opportunities through funding programs for innovation and implementation.

Advancement of academic careers is tied to scientific excellence recognized by peers. Funding agencies have in their mandate to distribute funding in an efficient and effective manner have resulted in metrics such as publications and citations in high prestige journals central for advancement of the researcher's career. With limited time, activities tied towards exploitation of their research results and innovation is reducing their time spent on research and could hinder the advancement of their academic career if this is not considered for when evaluating professor/associate professors and promotions.

In the participating HEIs this practice is handled differently both due to the different power the state is giving the universities, and as well different laws. In Norway, the competence requirements are regulated by "regulations on employment and promotion in teaching and research positions" by ministry of knowledge. The regulations set criteria for all teaching and research positions, but does not include innovation, commercialization, patents or other IPR production for hiring or promotion. The regulations allow for the universities to add their own criteria's. Looking at NMBUs guidelines for hiring and promotion in educational- and research positions from 2019 only demands scientific or artistic activities at a high level, and documented competences in teaching and guidance at higher educational levels. Similarly at EMU there is no explicit merit for innovation where academic research and development and lecturing staff are expected to do work within teaching and lecturing.

At LNU, SLU and LBTU the guidelines also include other merits. Linnaeus University have collaborative merits which assesses cooperation with the surrounding society based on the scientific and educational activities and how dissemination and utilization of the research have been done. This includes advice, knowledge exchange and public education such as participation in media, patents and patent applications and commercialization of research results. In Latvia and LBTU acquiring intellectual property rights and introductions of new product or services and its success is being evaluated for professor or associate professors.

Providing merit for innovation and knowledge transfer can be utilized both as a tool to incentivize academic staff to work towards utilization of their knowledge and research results outside of academia, while at the same time benefitting their academic career development.

The consortium wants to suggest that innovation, commercialization, and utilization should be seen as a completion to the scientific and pedagogic merit when applying for higher appointments and career advancement. Based on Chalmer University of Technology's guidelines we want to suggest the following qualifications as a supplement to merit for research and teaching and can be weighted differently depending on field or subject:

- Actively making research results visible to increase the publics knowledge of how science and research can contribute to good social development.
- Advice to decision makers in the private, public, and non-profit sectors
- Participation in public debate and opinion formation
- Ability to contribute to impact in society where research results and knowledge are applied as a basis for new innovations, methods, products, processes, treatments, standards, behaviors, industry norms, services, and companies.
- Granted patents and other types if IP creation.

Student innovation.

Innovation is considered as one of the major driving forces of 21st century, where higher education institutions play a considerable role. That is why it is logically that innovation is one of the key words in the Bologna process and higher education institutions should become the centers of innovation and creativity. In this section we have analyzed activities and policies fostering student innovation in Nordic-Baltic universities.

Policies on idea generation and innovation competence building

Networking and idea generation events are well developed and works effectively in all surveyed universities – LNU, SLU, NMBU, LBTU, EMU. There can be identified quite great variety of different events for students, but as the most commons can be mentioned as follows - annual business idea competitions, annual intra university innovative idea competitions, hackathons, exhibitions, and student conferences. All these activities are directly or indirectly stimulated by different levels – institutional and national level – documents. In all surveyed universities exists policies where importance of competence building in innovation has been stated, for example:

- NMBU strategy 2023-2030;
- LBTU Development Strategy 2023-2027;
- Estonian University of Life Sciences Development Plan for 2016–2025;
- Activity plan 2021-2025 of Estonian University of Life Sciences;
- The Green University Strategy of the Estonian University of Life Sciences until 2025.

Policies on formal education in innovation

Formal education with a focus on the development of innovation and entrepreneurial skills is well developed and works effectively in surveyed universities. For example, in Norwegian University of Life Sciences there are around 30 courses with innovation content, and special master program in Innovation and entrepreneurship. But in Estonian University of Life Sciences and Technologies at PhD study level there is one entrepreneurship course facilitating PhD students to think on their research commercialization. Taking experience from Estonian colleagues also in Latvia University of Life Sciences and Technologies innovation and entrepreneurship developing study course

at PhD study level has been developed. Example of policies that affect formation of formal education in thematic of innovation and related issues:

- Universities Act in Norway;
- IPR policy Norwegian universities;
- NMBU Strategy 2023-2030;
- LBTU Development Strategy 2023-2027;
- The Swedish Higher Education Act;
- Latvian National Development Plan 2021-2027;
- Science, Technology Development and Innovation Guidelines for 2021-2027;
- Estonian University of Life Sciences Act;
- "Estonia 2035" development strategy;
- Code of Conduct for Research Integrity;
- Activity plan 2021-2025 of Estonian University of Life Sciences Development plan until 2025;
- Higher Education Act in Estonia.

Although the political framework has been established in all the studied universities, there is a need to develop General guidelines for student innovation and General guidelines for student entrepreneurship.

Policies on advisory services and mentoring

Advisory services and mentors are very important as it gives missing knowledge, understanding and confidence on potential of business idea. As good examples in student advisory and mentoring can be mentioned special mentoring programs developed, for example in Estonian University of Life Sciences and Latvia University of Life Sciences, advisory provided by special structural units responsible for innovation and knowledge transfer, like Ard Innovation in Norwegian University of Life Sciences and SLU Holding in Swedish University of Life Sciences.

Policies on co-working spaces, incubators, and accelerators

As regards co-working spaces – in almost all surveyed universities special spaces like, Open laboratory, Virtual and Mixed Reality Lab, Interdisciplinary Scientific Laboratory, university campus spaces, have been created, but due to lack of proper communication and coordination in many cases these spaces don't gather and attract students. To solve this issue, for example Norwegian University of Life Sciences in January 2023 opened new establishment "BIT innovation center" that houses several key players in the innovation ecosystem at Campus Ås. Very similar situation can be observed with prototyping options – in the surveyed universities there have been created infrastructure available for students for making different trials, tests, prototypes, like, experimental/field bases of the university,

Open laboratory services, research institutes, science parks. However, due to lack of proper communication and coordination in many cases students lack information about options offered by university for boosting their business ideas.

Development of university level incubators and accelerators are quite a new tendency in innovation ecosystems of higher education institutions. These innovation ecosystem elements provide the means and create conditions that enhance and encourage students to move towards entrepreneurship and transfer knowledge from academic field to business activities. In all the universities surveyed this is a new issue and they have started to work on this. For example, in Latvia University of Life Sciences and Technologies since 2021 student business incubator "HatchUp" has started to operate and offers to students' different business idea generation events, organizes hackathons, offers mentoring and consultations with entrepreneurs.

Further incentives for making student innovation policies to work better.

The evaluation of the different policies forming ecosystems for student innovation showed that ecosystems have been established in all the studied universities, but improvements are needed in building better and more integrated innovation capacity and support systems. Each higher education institution involved in this study sees opportunities for further improvements in their student innovation policies.

- In ***Norwegian University of Life Science*** as main weaknesses in existing policies affecting student innovation were identified low communication and lack of coordination between initiatives, and low knowledge about the innovation process and regulations. Therefore, as potential improvements in this institution could be Simplifying and increasing commercialization of research driven innovation through improved policies and incentives for students and staff to engage in innovation and entrepreneurship.
- In ***Estonian University of Life Sciences*** as main weaknesses in existing student innovation policies were identified lack of an all-university-wide model for coordinating, financing, evaluating, and sharing information on entrepreneurial activities of students and employees, lack of success stories and success experience for selling of intellectual property, lack of incentives and motives for staff for entrepreneurial activities and entrepreneurship support. Therefore, as potential improvement in this institution could be development of all-university-wide model for coordinating, financing, evaluating, and sharing information on entrepreneurial activities of students and employees.
- In ***Latvia University of Life Sciences and Technologies*** as main weaknesses in existing student innovation policies were identified low interest of students and staff in business idea development and commercialization, low knowledge about the innovation process and regulations. Therefore, as potential improvements in this institution could be coordinated implementation of ideation process and improved policies for students and staff to engage in innovation and entrepreneurship.
- In ***Linnaeus University*** as main weaknesses in existing student innovation policies were identified lack of an all-university-wide model for coordinating, financing, evaluating, and sharing information on entrepreneurial activities of students and employees, lack of incentives and motives for staff for entrepreneurial activities and entrepreneurship support and collaboration with business management advisors. Therefore, as potential improvements in this institution could be development of an all-university-

wide model for coordinating, financing, evaluating, and sharing information on entrepreneurial activities of students and employees.

- In ***Swedish University of Agriculture Science,*** a main weakness in existing student innovation policies were identified weak communication between the external and internal parts of the university's innovation system, and low awareness and interest of students on business idea development and commercialization. Therefore, as potential improvements in this institution could be development of easy-to-conduct study modules on the topics of innovation and entrepreneurship that could increase student's awareness on the innovation process, and the possibilities to go from idea to product ready to commercialize with the help from supporting innovation system actors.

The suggested policies are separated into policies for education and policies for supporting student entrepreneurship. The NOBALIS consortiums suggest the following policies for I&E education:

- All students should have access to I&E courses through during their bachelor's or master's degree.
- Provide funding for courses on entrepreneurship across disciplines.
- Promote entrepreneurship training for university professors and lecturers.

And the following as policies to support student entrepreneurship:

- University-based research commercialization and entrepreneurship centers to support student-led innovation.
- Provide work opportunities for students in business incubators, knowledge hubs, technology transfer office etc.
- Support student entrepreneurship competitions and awards.
- Provide access and routines for student ventures to university owned intellectual property.
- Provide access and for student ventures to use lab facilities with permission from the respective head of laboratory.

Participation of non-academics/technical personnel in start-ups/Innovation projects.

Non-academics personnel play a crucial role in the success of startups and innovation projects but their role in some cases is underestimated. In academic institutions non-academic personnel can be roughly divided into non-academic technical personnel and non-academic non-technical personnel. In majority of the universities the proportion of non-academic personnel is more than half compared to the academic Although, sometimes it's hard to define the exact distribution as laboratory assistants and IT technician may provide similar services to the innovation projects.

Non-technical/non-academic personnel, like librarians, human resources, communication managers, project managers, legal representatives and their participation in different seminars, life-long learning courses designers etc.

- data management: collection and data design, data platforms management, customer service design according to the market trends.
- communication managers: noticing, managing, and boosting the unseen or under communicated academic innovation, simplifying the importance and need for innovation in society and marketing the solutions.
- business/public sector facilitators: supporting academic and non-academic innovation (IP, market search etc.), valuable input to the academic long-term innovation plan with the helicopter view of innovation of the organization and beyond to solve the real/future societal problems.

Technical/non-academic personnel, like project managers, lab assistants

- innovation project support managers (project managers): technical support of the innovation projects to keep them in track (budgets, deadlines, reports etc.).
- lab assistants – supporting the innovation creation in the labs (lab tests etc.).
- field experiment assistants – innovation processes in the fields.

Participation of the communication team in innovation/academic projects is crucial to foster the collaboration to fill in the cap between the technical teams and other stakeholders. Although the need and the impact are commonly known, it's not always accessible (due to the limited budget) for most of the research teams responsible for innovation projects in academia.

The strategic inclusion of the non-academic personnel is dependent on the certain academic long-term vision to fill in the current existing cap. Not every university brings forward the non-academic personnel impact into innovation, although it exists. Some universities have defined specific units focusing on supporting innovation process and projects in the organization managed by non-academic staff (project managers). On the other hand, in project managers are recruited only for the project duration and therefore makes the innovation process hectic.

In academic organization to support the innovation project management requires unit(s) of balanced team(s) with both motivated technical and non-technical non-academic expertise to enable the knowledge spillover. Combination of non-academics and non-technical personnel bring essential skills and perspectives that are crucial for translating innovative ideas into innovation project, successful products or services and build a good ground for knowledge-based start-ups.

KPIs for innovation.

Through the project we have also discussed how we measure the innovations from our universities. What we discovered is that all universities measure innovation outcome utilizing patents, license agreements and revenue generated. While this is measuring innovation, it measures it very narrowly. To measure innovation, we recommend including more KPIs, and include KPIs that measure student innovation activities and results. In table 2 we have the suggested KPIs.

Table 3: KPIs for innovation activity and measuring systems.

Phase	KPIs	Students	Academic staff	Non-academic staff
Education	Percentage of target groups that have access to trainings in entrepreneurial development at their university.	X	X	X
Idea Generation and competence building	Percentage of target groups that have access to trainings in innovation at their university.	X	X	X
	Number of submitted ideas per 10,000 full-time equivalent students (HST)	X		
	Number of submitted ideas per 1,000 full-time equivalent doctoral candidates	(X)	(X)	
	Number of submitted ideas per 1,000 full-time equivalent academic staff		X	
	Number of submitted ideas per billion research funding	X	X	X
Research and innovation.	Percentage of researchers engaged in KT (and change over time) excluding publication and teaching		X	
Research and innovation.	Number of research collaboration agreements & research contracts with non–		X	

	academic third parties — number a. Number with companies b. By other non–academic third parties			
	Number of student ideas that have progressed to recipients per 10,000 HST	X		
	Number of ideas that have progressed to recipients per 1,000 full-time equivalent doctoral candidates	(X)	(X)	
	Number of ideas that have progressed to recipients per billion research funding		X	
	Number of ideas that have progressed to recipients per 1,000 "currency" revenue to the innovation office	X	X	X
	Percentage of ideas that have progressed to recipients out of the total numbers of submitted ideas	X	X	X
	Number of patents and other IPR-licensing that have been made per 1000 "currency" revenue to the innovation office	X	X	X
Commercialization and utilization	Number of university-student startups per 10,000 full time equivalent students (HST)	X		
Commercialization and utilization	Number of started academic companies/startups per billion research funding		X	
Commercialization and utilization	Number of impact outputs in: a. legislation, b. culture, c. business practices d. others. *) Could be described in combination with evidence–based case studies.	(X)	X	

	*) At all levels above assessment by a group of external specialists to describe level of matureness and performance of the Innovation office.			

The "X" in the box marks which groups innovation activities are being measured by the KPI. The "(X)" marks where Ph.D. students are being measured which could be seen as either students or employees based on the institution and their relation to the HEI.

Incentives for innovation.

Innovation leave.

Even with policies and frameworks that facilitates, having incentives that motivates the staff is just as important. One such incentive could be innovation leave. Innovation leave is based on research leave that many HEIs have, where researchers with permanent position or tenure can apply for some time off their regular duties for research. The main difference is that innovation leave would be for the researcher to explore commercialization of their research results, instead of research projects.

Ard Innovation did a pilot for Innovation leave with the purpose to enable the researcher to go through one year focus on business development from basic research. The work was done as an extension of a postdoctoral position. The aim was to identify, develop and bring the research result towards a commercialization application during the 12-month period. The researcher was coached throughout the project by internal resources in the local TTO. If successful, the concept could be implemented as an offer to employees in the HEIs to support and elevate innovation capacity. Full report can be read in annex 2: Innovation leave pilot.

Key learning aspects from the pilot was the switch from a researcher's perspective to a business developer/innovation mindset. An interesting research observation can be interesting from a research perspective, but not necessarily be used to solve an immediate industrial problem. Similarly, a mundane observation in research that is not worth pursuing could be worth pursuing for a business angle because it could be transformed into a valuable technology. From the point of view of the researcher a lot of learning relate to communication, mindset and risk taking. This could mean pivoting when pivoting would mean that focus should be directed at results which were not the researcher's preferred areas from the beginning of the project. In terms of mindset, it was important to question the possible industrial application and whether it would make sense. The pilot project enabled risk taking and exploration of paths that would not necessarily have been pursued without the project. It allowed the researcher to think problem seeking solution rather than solution seeking a problem. Through the project the researcher was also responsible for writing application for further financing. The researcher learned how to structure, convey, and sell the research idea in a different format than they trained for through research.

The project yielded good results with lots of learning from both the TTO and the involved researchers. The research group involved also liked the idea of this due to both training of a "champion" that would bring this type of competence into the group, but also due to the actual innovation that may come out. For innovation to become at an equal level as research education in the HEIs towards 2030 as stated in the project vision we should continue to look at how other incentives that exist can be tailored to fit innovation as well.

The consortium suggests a policy that extend the academic leave to include commercialization and knowledge transfer activities.

Funding opportunities and financial incentives.

Financial risk attached to entrepreneurship and innovation can be a deterrent for students and researchers to proceed with their ideas. Very often students have limited funds for entrepreneurial ventures and are faced with challenges already in the early stages of development with how they can validate their ideas. In the cases of the researchers and other employees in the universities they already have a salary from the universities. A lot of activities are funded through external sources such as research grants and are an important source of income for the university to finance one of its core activities. To motivate the researchers to pursue their ideas financial incentives can be used to elevate the loss of income both for the individual and the institution.

The financial incentives can be organized in multiple ways depending on factors such as state-aid laws and anti-competitive. In this report we want to showcase some examples of financial incentives from the consortium that can be inspire or be replicated by other institutions.

Table 2. overview funding opportunities and financial incentives.

Type	Financial source	Target audience	description
Verification funds	ALMI company partner	Start-ups and existing companies with innovative business idea in a development phase	Almi's verification fund are used to get answers to critical questions and thereby reduce the risk in the development of a potential innovation. To be used for the purchase of external services for one or more of the following purposes: • Verify customer needs. • Market overview. • Competitor/industry analysis. • Novelty search. • Freedom to operate. • Patentability assessment.

			• Technology overview. • Development of MVP. • Legal and regulatory issues.
	Norwegian research council	TTO, approved research organizations, start-ups originating from research organizations.	Yearly call for commercialization of research results from public funded research. The call is separated into two parts. • Qualification project – up to 500 000 NOK. • Verification project – up to 5 000 000 NOK. The qualification project is intended to be used for initial research of possible application of the results and create a basis for the verification project. Verification project covers the first phase from technology to pre-commercial phase to reduce technology and market uncertainties.
	Innovation Norway start-up grant 1	Start-ups	Up to 150 000 NOK to validate market need and willingness to pay. The company should be no older than 3, but there are exceptions for 5 years. the grant can be used to: • Create a MVP. • Activities to gain insight into customer needs. • Cost attached to build network and increase competencies relevant to the project.
	Vinnova Verification money	Students, researchers and employees at universities, colleges and research institutes	The call supports the application and exploitation of innovative ideas by verifying/validating ideas and business concepts with the potential to generate goods and services that can contribute to sustainable growth, increased competitiveness and societal benefit. Vinnova funds up to 300 000 SEK per innovative idea. Activities must be carried out step by step in such a way that relevant areas for utilization in an iterative process characterized by well-founded assumptions/hypotheses around the idea and how its utility is tested and adjusted.
	Idea stimulation for NMBU employees	Researchers at NMBU	From 30 000-100 000 NOK with the purpose to bring innovative ideas a step closer to the market and is often

			used to do activities that increases the likeliness of receiving other grants.
Start-up grants	The Swedish Innovation agency	Small, newly started joint-stock companies younger than 5 years with less than 2 million SEK turnover and have not distributed profits.	Support companies where the whole business idea is to contribute to solving a global societal challenge. The grant is up to 300 000 SEK and can be used for: • Prototyping. • Development of business and sustainability strategies. • Verify customer benefit. • Verify willingness to pay. • Build customer relationships and partnerships. • Strategy to protect the company's new solution.
	Innovation Norway STUD-ent	Students	Students from Norwegian HEIs with validated business ideas or defined market can apply for a 1 million NOK grant for development and commercialization. The call is open for all students on master's and doctoral level but to be eligible you need to be: • Newly graduated, no more than 12 months prior to application deadline. • At least 80% of shares owned by students. • Project manager must be enrolled in a masters-, professional, or Ph.D. programme. It is required that the start-up has a collaboration agreement with the study place, academic mentor, and commercial mentor. It is also required that there is a significant degree of innovation in the product or service delivered.
Competitions	Linnaeus University's innovation call	Researchers and doctoral students	The intention is for the call to reflect and capture the breadth, innovative spirit, and pursuit of a shared sustainable future of the entire university. Funding will not be granted for research purposes but should instead be used to implement research findings outside of academia. The selected applications will receive 250 000 SEK each to use towards working on their idea. This can be used for personal time, or other efforts

			aimed at developing the idea towards practical application.
	Venture cup Norway	Students	National pitching competition for students in Norway. The program is run by Start Norway, a student organization focusing on innovation and entrepreneurship amongst university students with representatives at most universities. Venture cup is a competition held through different rounds starting with qualification at regional level and ends up with a national finale. Grand price is 100 000 NOK. There is a requirement that the startup is 50% owned by active students and that the pitchers are registered students.
	Venture cup Sweden	Students	Competition that connects experts from the business world with the entrepreneurs of the future. Venture cup offers inspiration, education, guidance, and opportunity to create a solid network. Prize money range from 10 000-50 000 SEK. 19 awards will be given out in Sweden each year.
	SEFiO	Students	SEFiO is the student entrepreneurial fund in Oslo where universities in the region together with the energy company Anneo and Oslo Municipality gives students the opportunity to apply and compete for 25 000 NOK for early-stage funding of their project. In addition, the students receive counseling for funding applications.
	SLU and Sparbankens Price of Innovation	Researchers and students at SLU	In three of SLU Holdings locations, they award from 50 000- 200 000 SEK to innovation within green industry. The funds are an investment in stimulation new innovations from researchers and students at SLU.
Seed funding	EQUITY	Researchers and students	Early-stage investment through Linnaeus University Development AB into researchers' and students' ideas against part of future profits, shares or future companies. Linnaeus Venture AB (subsidiary) together with LNUs innovation office have activities that complement each other and work closely together to give ideas from the university the best possible conditions to be commercially successful. Activities that can be funded: • analysis of customer and user needs. • Verification of production methods.

			• Analysis of regulatory and legal requirements. • Technical verification aimed at minimizing project risk. • Patent and/or trademark protection. • Shareholder agreement.
Other grants	Innovation Vouchers program	Researchers, entrepreneurs	The Innovation Voucher program provides innovation vouchers to businesses to support development of new or significantly improved products or technologies that contribute towards the Latvian Smart Specialization Strategy. At LBTU the program is realized by the Technology and Knowledge Transfer Office by offering competences of scientist, services, and cooperation options. The grant has two levels, 5000 Euro introduction and 25 000 Euro regular voucher. Activities that can be funded: • Technological-economic feasibility study. • industrial research. • experimental development including production and prototypes, product industrial design development. • testing and certification services. • consolidation of IPR. • attraction of highly qualified employees.

In addition to grants and competitions there are also innate incentive for commercializing through generating income based on the IP produced. In Sweden where they have the professors privilege the researchers operates similarly to regular entrepreneurs where the inventor and investors share all the net revenue of licenses but also must take the risk and investments themselves. In the countries operating with employee inventions acts stating that the institution owns the created IP the incentives are different. For instance, in Norway, it's the norm that the inventor or inventors receive one third of the net revenue generated. This change in the law also created some of the structures that are in place today, such as technology transfer offices, to support the development. The risk and cost of the development is then taken by the institution instead of the individual.

Guidelines for implementation.

An important part of the work associated with the NOBALIS project is the work that comes after the project has been completed. A proposal has therefore been made for how implementation of the policies chosen by the project can be carried out in the institutions. The document consists of several elements. First, we will present a general part about what must be in place in a change process and which stakeholders will be the target. Secondly, we will enter a discussion on how the policies identified in the NOBALIS project can be implemented. The proposed strategies for implementation must be adapted to the individual institution and the individual country's regulations. However, there may be some generic elements that all partners can support and may benefit institutions outside the NOBALIS consortium.

Implementation is a process of change.

Implementation needs both culture change, competence building and anchoring. Anchoring requires decisions. Cultural change requires expertise and insight. Both need a common understanding of why they want change. How the implementation can take place also depends on which policies are to be implemented. If the goal is to change an attitude, and the change does not require budget authorization or rule changes, an important work tool may be communication and training. Nevertheless, a decision is required, and resources need to be allocated to training and communication work. There will also be different stakeholder groups to target, in parallel or in sequence. This depends on whether the main emphasis must be placed on decisions or expertise.

Decisionmakers.

In order to make decisions, it will first and foremost be management and formal bodies that must be targeted. In terms of leadership, for a university there will be several levels that must participate in the decisions:

Centrally:

- Board
- Headmaster
- Provosts
- Managing Leadership Central

Locally:

- Faculty Board
- Deans
- Adm management faculty.

There may also be several other councils and committees that need to be involved. The Council structure will vary between institutions, but typically there is a Research Committee and an Education Committee at a university. In some cases, this committees are only central, in other cases there are both central and local committees of this type. All universities also have a board, and if the decision to be made has organizational or financial consequences, the matter must also be dealt with at the highest level.

To achieve an anchored implementation of new policies, change management is required. There are several motivational factors that are necessary to bring about a change. Here we assume that the decision has been taken in the necessary forums. The overall goal is increased innovation capacity.
From change management theory, the following factors can be obtained:

- *Create a common impression that the change is necessary and that it must be made now.*
  Here, the world situation's need for green change etc. can appeal to all levels and different stakeholder groups in the organization. Finding a common goal that no one can object to should be possible for universities working in the environmental and life sciences.
- *Prepare individuals for how to adapt to the changes*
  Here, workshops, courses etc. can be instruments. For a university, it will be particularly important to be able to relate the needs for change directly to the individual researcher's research/field of study. In NOBALIS, we have therefore used both mentoring and Impact Canvas as tools in this work.
- *Creating opportunities for early success*
  From NOBALIS we can use the EICD program, mentor program and other tools developed through the project as tools.
- *Keep people informed about progress in the change process*
  In NOBALIS we have a separate work package for communication. Information videos and other materials are developed here that can be used to communicate the results.

For autocratic institutions, opinion formation and "rings in water" will have a greater effect than decisions made at the leadership level. For most institutions, a combination of decision-making and opinion formation will be most effective. Authoritarian leadership is alien to a university, so a grounding in upper management may not be sufficient to implement a change. The order in which decisions are made depends on the organization of the individual institution.

Competence building

In order to submit decisions to boards and councils, a good basis for decision-making must be prepared. This requires that the administration has sufficient information on the subject to be able to make good case presentations and a basis for decision-making. It also requires that the people who sit on the various councils and committees have sufficient expertise to be able to make the right decisions. It is also the case that all stakeholder groups at a university are represented in the decision-making bodies. This means that everyone should possess a

minimum level of knowledge about innovation and innovation if the institution's ability to innovate in general is to be increased.
For innovation and innovation work, it has been shown that this is not the case to a sufficient extent. In the next section, we will therefore present some concrete proposals for competence-building measures for the various stakeholder groups.
In addition to institutional decisions, individuals must make decisions to engage in innovation work in their daily work. This means that messages must be prepared that are adapted to the needs of the individual stakeholder group.

What tools do you have access to and to whom?

Through the project period we have developed several competence-enhancing measures for the various stakeholder groups. These are described in more detail in separate reports. Examples of tools:
Course on frameworks and regulations for managers and decision makers

- Impact workshop for researchers
- Mentoring programme for researchers
- Teaching modules for educators
- Educational modules for students
- Hackathons for students and researchers
- Mentoring programme for students
- Courses on innovation for non-academic employees

Universities are democratic institutions. As mentioned earlier, the various stakeholder groups will often both be represented in the formal bodies and operate as important opinion formers. We have therefore looked at the various stakeholder groups to see which of the tools developed in NOBALIS could fit the needs of the different groups.

External framework conditions

In NOBALIS the main task has been to address issues inside the HEIs. Thus, external framework has not been the focus area. Still, we have maintained the HEIs external relations as is, and entered some new relations.
We have identified some structures that should be available to access for increased innovation level for a HEI:

- Financing.
- Merit structures.
- Receiving apparatus outside the institution.
- Industry structure.
- Start-up capital.

- Investor competencies.

In NOBALIS some partnership agreements have been established during the project period: One agreement between a HEI and a municipality, HEI and technology park, one agreement between a HEI and an investor network (Tech Tour). The latter has enabled an overview of funding structure of start-ups in Europe.

Needs at the institutional level.

For a university, research and education are the core activities. Innovation will often be a conflict of interest regarding discussions on budget and strategy. It is therefore important that innovation is high up on the agenda at the institutional level.
Below you will find a list of tasks and subjects that should be in place at the institutional level.

- Have a plan and strategy for innovation.
- Facilitate individual conditions for researchers and teachers.
- Have incentives and reward systems.
- Provide funding and resources.
- Have lessons for students.
- Have good laboratories/test facilities/prototype lab.
- Facilitate meeting places for innovation.
- Ensure that this is implemented without compromising primary function.
- Have limits and regulations in place.

For researchers

For researchers, research activities and educational work is the primary focus. To enable understanding of innovation, not as a competing activity, but more as an integrated part of the research activity, it is necessary to raise the level of innovation in the research groups.
What do researchers need to understand the value of Innovation activities?

- Understanding impact.
- See the value of your own research.
- Recognize the needs of society.

Here, tools such as Research impact workshop is useful together with mentoring kits in the WPs. Plan for impact at all levels of the organization requires some resources in the form of people who have the time to implement this.

For students

The students could be one of the driving forces in raising the innovation capacity of a university. Students work faster, have less concerns about risks, and are curious in another way than researchers. But also, for students some elements must be in place to make this happen:
What do students need:

- See the value of your own master's theses.
- Have access to basic knowledge about innovation.
- Access training, guidance, and meeting places.

In NOBALIS we have developed the EICD program, the Hackathon and developed regional initiatives such as the "StartUp Smia" to continue similar activities going forward.

For administrative support system

To ensure that Innovation will be a part of a HEIs daily activities we have identified the administrative support system as a traditional hurdle. To overcome this NOBALIS has developed a course for this group to try to identify how the administrative and technical staff can support innovative activities.
The different groups of administrative and technical staff can assist in this activity:

- Library –Patent Literature.
- Communication – visibility.
- Finance – budgeting and application writing.
- Laboratories – infrastructure and expertise.
- IT – data management, storage, processing, and hosting.
- Lawyer- IP management, agreements, rules, and guidelines.

It is a separate report on the course for non-academics, where we have described how the non-administrative staff can and should play a role in innovation activities.

Implementation in NOBALIS

NOBALIS has identified four policies that we believe are deficient or should be rectified after mapping the current framework of the participating institutions.
The policies are:

- Secondary positions.
- Merit for innovation.
- Students in innovation projects.

- Participation of non-academic/technical personnel in start-ups/Innovation projects.

The policies are geared towards different stakeholders and require somewhat different approaches. To address this, we have developed a matrix to map and plan the implementation. The matrix defines the target group who is affected, who the agent of change is, the decision level, which tools we have, the resources needed, and other comments that are needed.

Type of change	Target group	Decision level	Tool	Resource needs	Comment
Secondary positions	Researchers	Faculty	Policy for secondary positions	Standard agreement	Decision level may vary with institution
Merit for innovations	Researchers	Government, board	Lobby, meetings, workshops	Evaluation criteria's	
Student in innovation projects	Students	Faculty and researchers	Policy	Standard agreements	Be aware of IP regulations
Participation of non-academics	Non-academics	Faculty and researchers	Policy, meetings, workshops	Standard agreements	Be aware of IP regulations

Due to different cultures, laws, and different modes of leadership at universities, together with the democratic nature of universities, implementation in one university would differ from the next one. The matrix based on experiences from Norway at NMBU. Using the tool could contribute to make a systematic implementation with the necessary stakeholders involved.

Annex 1: Reviewed policy documents

Estonian University of Life Sciences Act	Institutional level	EMÜ	Estonia
"Estonia 2035" development strategy	National level	National level	Estonia
Code of Conduct for Research Integrity	National level	EMÜ	Estonia
Development Plan of the Field of Agriculture and Fishery until 2030	National level	National level	Estonia
Estonian Research and Development, Innovation and Entrepreneurship Strategy 2021—2035	National level	National level	Estonia
Statutes of Estonian University of Life Sciences	Institutional level	EMÜ	Estonia
Estonian University of Life Sciences Developement Plan for 2016–2025	Institutional level	EMÜ	Estonia
Activity plan 2016-2020 of Estonian University of Life Sciences Development plan until 2025	Institutional level	EMÜ	Estonia
Activity plan 2021-2025 of Estonian University of Life Sciences Development plan until 2025	Institutional level	EMÜ	Estonia
The Green University Strategy of the Estonian University of Life Sciences until 2025	Institutional level	EMÜ	Estonia
Good Academic Practice and Implementation of Principles of Academic Ethics in Estonian University of Life Sciences	Institutional level	EMÜ	Estonia
Framework Requirements for Veterinary and Civil Engineering Studies in Estonian	National level	Estonia	Estonia
Procedure for intellectual property created at Estonian University of Life Sciences	Institutional level	EMÜ	Estonia
Good Academic Practice and Implementation of Principles of Academic Ethics in Estonian University of Life Sciences	Institutional level	EMÜ	Estonia
Procedure for use of baseline funding of research and development activities	Institutional level	EMÜ	Estonia

Higher Education Act	National level	Estonia	Estonia
Organisation of Research and Development Act	National level	Estonia	Estonia
Standard of Higher Education in Estonian	National level	Estonia	Estonia
Statutes of interdisciplinary units (Centre of Renewable Energy, Centre of Bioeconomy, Organic Centre, Polli Horticultural Research Centre)	Institutional level	EMÜ	Estonia
Estonian Business and Innovation Agency Strategy 2025	National level	Estonia	Estonia
Estonian Patent Act	National level	Estonia	Estonia
Startup Estonia White Paper 2021-2027	National level	Estonia	Estonia
Personal research funding	National level	Estonia	Estonia
Proof-of-Concept Grant	National level	Estonia	Estonia
Programme for applied research	National level	Estonia	Estonia
Funding	National level	Estonia	Estonia
Statsstöd	International level		EU
Research and Innovation	EU level	European Union	EU
LBTU Development Strategy 2023-2027	Institutional level	LBTU	Latvia
Scientific projects financed by LBTU	Institutional level	LBTU	Latvia
Nationally financed scientific projects	National level	LBTU	Latvia
E-journals	International level	LBTU	Latvia
Patents	Institutional level	LBTU	Latvia
International research projects	International level	LBTU	Latvia
International scientific conferences	International level	LBTU	Latvia
Research laboratories	Institutional level	LBTU	Latvia
Technology and Knowledge Transfer Office (TEPEK)	Institutional level	LBTU	Latvia
Research fields	Institutional level	LBTU	Latvia
Research institutes ans stations	Institutional level	LBTU	Latvia
Zemgale Planning Region	Regional level	Zemgale region	Latvia
Latvia Rural and Education Advisory Centre	National level	Latvia	Latvia
The Law of Scientific Activities	National level	Latvia	Latvia
Smart Specialisation Strategy (RIS3)	National level	Latvia	Latvia

Latvian National Development Plan 2021-2027	National level	Latvia	Latvia
Science, Technology Development and Innovation Guidelines for 2021-2027,			Latvia
Universities Act	National level		Norway
Employee Inventions Act	National level		Norway
The Copyright Act	National level		Norway
The Patents Act	National level		Norway
IPR policy Norwegian universities	National level		Norway
NMBU Strategy	Institutional level	NMBU/Ard	Norway
Guidelines for intellectual property rights and physical material in external relations	Institutional level	NMBU/Ard	Norway
Guidelines on the employer's right to work results	Institutional level	NMBU/Ard	Norway
Rules for the distribution of net revenues from commercialisation	Institutional level	NMBU/Ard	Norway
Hability and regulations for secondary positions outside the university	Institutional level	NMBU/Ard	Norway
Hurdalen Governmental Platform	National level		Norway
Research Council programs	National level		Norway
Innovation Norway	National level		Norway
Agreement student participation in research projects	Institutional level	NMBU	Norway
R&D provider in innovation projects	Institutional level	NMBU	Norway
Stud-ent Innovation Norway	National level		Norway
General guidelines for student entrepreneurship		NMBU	Norway
NMBU strategy 2023-2030	Institutional level	NMBU	Norway
State aid regulations	National level	NMBU	Norway
Student incubator agreement University of Agder	Institutional level	University of Agder	Norway
Agreement for use of 3D printer	Institutional level	University of Agder	Norway
Aneobidraget - grant for NTNU students	Institutional level	NTNU	Norway
NTNU discovery grant	Institutional level	NTNU	Norway
Idea stimulation grant for researchers	Institutional level	NMBU	Norway

Extra source of income	Institutional level	University of Oslo	Norway
Secondary positions – NMBU faculty of Science and Technology operationalized	Institutional level	NMBU	Norway
Guide to agreement template regarding student participation in research projects	Institutional level	NMBU	Norway
The Swedish Higher Education Act	National level		Sweden
Professors privilege - ACADEMIC STAFF'S and students INTELLECTUAL PROPERTY RIGHTS	National level		Sweden
Copyright act	National level		Sweden
Patent act	National level		Sweden
Collaboration university - business	National level		Sweden
Research and innovation proposition	National level		Sweden
Policies for IPR in research agreements	National level		Sweden
Insights from utilization of Swedish research	National level		Sweden
SLU IPR policy	Institutional level	SLU	Sweden
KTH IPR policy	Institutional level	KTH	Sweden
Patent and Trademark Act Amendments (Bayh Dole Act)	National level		USA

Annex 2: Innovation leave pilot.

Summary

There is a huge need among the academic research groups for human resources with capacity and interest to focus on innovation, and to work on business development activities needed to bring ideas from research into a validated business concept. The purpose of the pilot was to enable for a researcher to through one year focus on business development of a specific business idea coming from a research project. The work was done as an extension of a postdoc position. The aim was to identify, develop and bring the research result towards a commercialization application during a period of 12 months. The champion was coached throughout the project by internal resources in the local TTO.

If successful, this concept could be implemented as an offer to employees in the HEIs to support and elevate innovation capacity. The offer could then be a parallel to today's research exemption scheme and be called "innovation-free." This report gives a summary and learning points from one innovation-free pilot at NMBU during 2023.

Description of the project/Project outline

The pilot-project was divided in three work packages:

WP1:

- mapping of technology
- comparison of potential usage of technology (enzyme, substrate, met hod, industry, etc.)
- collection of market information and alignment of technology and market.

WP2:

- developing of the technology in laboratory with the goal of proof of concept with regular market/industry fit/alignment.

WP3:

- insight on product/market fit
- market development
- industry insight
- potential of proof
- of concept technology
- commercial potential-

- business model/plan and future funding of technology (application RCN Qualification/Verification application)

The project also included an evaluation and plan for follow-up after completion of the pilot. Each work package had learning goals both for the researcher and for the TTO.

Implementation of the project

WP1

WP 1 had a duration of 1 month, hosted at TTOs offices with mentoring from key personnel from the TTO. The workload was estimated to be 1 month from the Researcher and 1 week from the mentor from the TTO.

The task for WP1 was to focus on the mapping of technology, comparison of potential usage of the technology, and collection of market information and alignment of technology and market.

WP1 contented these deliverables:

- Map chosen technology
- Choice of application area
- Overview of potential usage of the chosen technology
- Collect market/industry information on chosen technology
- Alignment of technology and market/industry
- Plan for WP2

Learning goals for the researcher:

- Evaluation of technology with commercial potential
- Market/industry evaluation of specific and unspecific technology
- Methods and techniques for evaluation

Learning goals for the TTO

- How to see potential in early-stage technology
- Insight in research mindset on evaluation of commercial potential

WP2

WP 2 had a duration of 9 months, physically performed at Research groups facilities at the HEI with mentoring from key personnel from the TTO and senior scientific staff at the HEI. The workload was estimated to 9 months for the Researcher and 2 months for the mentor from the TTO.

This WP had a focus on developing of the technology in laboratory with the goal of p oof of concept with regular market/industry fit/alignment.
WP2 contented these deliverables:

- Test technology chosen in WP1
- Proof of concept of technology chosen in WP1
- Market/industry fit/alignment; Laboratory work must be constantly calibrated against what is the need in the market and work towards concrete problem solving

Learning goals for the researcher

- Specific research towards proof of concept
- Ability to pivot research in line with commercial market/industry
- Constant evaluation of specific technology
- Evaluation on stage of development and balancing research/commercial activities

WP3

WP3 had a duration of 2 months, hosted at TTOs offices with mentoring from key personnel from the TTO. The workload was estimated to be 2 months for the Researcher and 1 month for the mentor at the TTO.

The focus of WP3 was on the insight on product/market fit, market development, industry insight, potential of proof-of-concept technology, commercial potential, business model/plan and future funding of technology (application RCN Qualification/Verification application).

WP 3 contented these deliverables:

- Insight in technology/market/industry fit
- Insight in technology potential
- Develop commercialization/business plan
- Secure funding for future development of technology
- Preparation for Qualification/verification application to RCN

- Identify resources needed for further development long term

Learning goals for the researcher

- Evaluate technology/market/industry fit
- Ability to develop business plan
- Ability to secure commercial project funding

To measure the progress during this pilot, IRL assessments were conducted at the start and at the end of the project, to map the six dimensions and are summarized in the two IRL figures below. In short, all the dimensions have been improved over the course of the project except funding which did not change. It should be noted that at the start of the project, the assessment was performed with several applications in mind and reflects the best aspect for each application while the assessment from December 2023 is focused on one specific application. The IRL assessments underestimate the actual progress made over the course of the project.

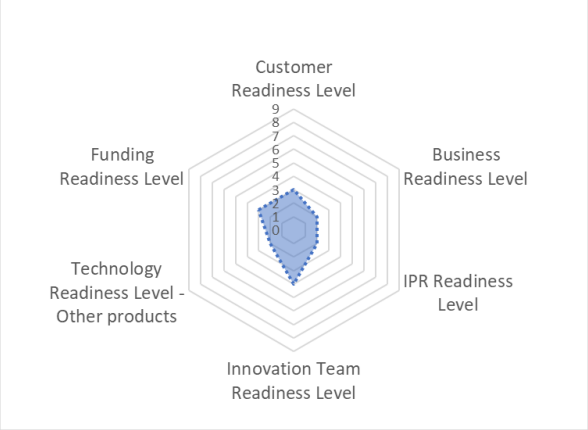

Figure 1 IRL assessment October 2022

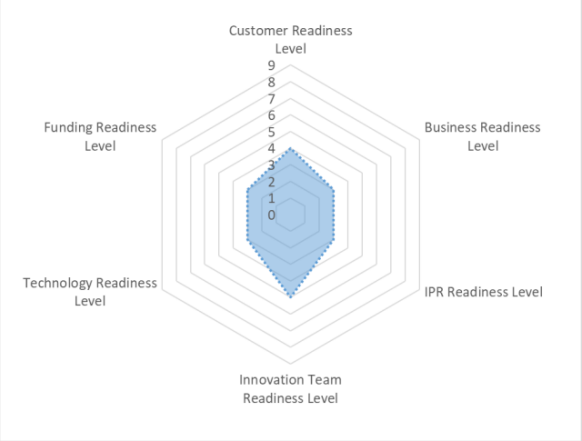

Figure 2 IRL assessment December 2023

Learning outcomes and experiences

The pilot project has been highly useful and educational for the research group behind it. Several commercialization routes could be assessed, and this would not have happened without the project. The group has gotten better insight into what is needed to make the next step on the TRL trajectory and has generally increased innovation awareness thanks to the project. The researcher will be a major source of innovation competence and inspiration for as long as he stays with the group; his endeavours have established a change of culture in the group. Dialogues on follow up projects are ongoing.

The project has demonstrated that a given TRL level can mean different things to the different people involved in the project, and that moving from one TRL level to the next is not necessarily something that is done overnight but may take time depending on the nature of the research area. The project team aimed to achieve a TRL 3/4 in this project but ended up with an application with a TRL2 based on experimental observations. This TRL only relates to the technology side, other aspects as shown in the spiderweb will show that we have moved the TRL level further.

WP1 learning outcomes

The most important learning aspect in WP1 for the Researcher was to switch from a researcher's perspective to a business developer/ innovation mindset meaning that an interesting research observation can be interesting from a research perspective, but that does not mean that it can be used to solve an immediate industrial problem. Similarly, a mundane observation in research that is not worth pursuing as a research question could be worth pursuing from a business development angle because it could be transformed into a valuable technology. During WP1, the Researcher has become familiar with the research impact canvas and has used this systematically to identify, explore and select the relevant materials for WP2.

The Researcher in such a project must from the beginning, express an interest in the commercial aspect of the research and be willing to pivot away from the pet idea if that is what is required to further advance toward a solution to an industrial problem. It is important that the researcher is motivated to think in terms of innovation rather than fundamental research.

The most important aspect for the TTO in WP1 was to learn how to communicate, deliver and share a TTOs insight to a researcher with an academic background. In addition, the TTO learnt how the TTO can work together with a researcher to develop a technology that the industry is need of. In summary WP1 did include an actual delivery of expected outcomes from by the TTO achieving insight and learning outcome that:

- groundbreaking research within the field does take longer than expected
- results cannot be steered by wish steered by wished outcome

- the field of enzymes technology still needs time to develop.
- it can be painful for researchers to work on only on solving a problem and not continuing with interesting science.
- TTOs need to be more patient.
- TTOs benefit from early insight into projects to understand timeline, possible timeline, possible technology application and commercial outcome.
- Close communication is essential and an understanding of the field of science from the TTO/Project leader helps guide the Researcher .
- The researcher needs qualified push-back and this competence should be present in TTO team.

WP2 learning outcomes

From the point of view of the Researcher, the learning aspects relate primarily to communication, mindset, and risk taking. The Researcher and Project leader communicated on, at least, a biweekly basis. These meetings were used to discuss the obtained results and decide on how to proceed when necessary. Having established a good working relationship and good dialog, these meetings laid the foundation for an open, honest, and direct communication bet ween the Researcher and Project leader to play ball and challenge each other to find the best solutions for further advancing the project. For the Researcher, this meant being able to accept pivoting even when pivoting meant that focus should be directed at results which were not the Researchers preferred areas from the beginning of the project. It is easier to abandon a line of investigation where one is not as emotionally invested. In terms of mindset, it was important to change gears from research to innovation and always question the possible industrial application and whether it would make sense. The Researcher must always think problem seeking solution rather than solution seeking a problem. This process started in WP1 and took until the beginning of WP2 to be fully implemented. The need to find problems and then test if our knowledge and technology can provide a solution is associated with risk of not getting positive results. The pilot project enabled risk taking and exploration of paths that would not necessarily have been pursued without this project.

The need for iterations and constant dialog was essential for this and similar projects. Through running bi-weekly dialog with Project leader, midway summary with all project participants /team and presentations from the Researcher at internal TTO team meetings the entire competence of the TTO was utilized and drawn upon. This ensured that Project leader and Researcher did not get caught in the field of science, but could always ensure that commercial potential, market fit, application, and so on was always evaluated. An important outcome of the meetings where the Researcher presented the project to either the TTO and /or extended project team or to the research group is that these presentations had to be tailored to the audience. For the research group meetings, this meant spending more time explaining the methodology and processes used in the project, notably. how to ensure commercial potential and market fit. For internal TTO or project the focus was on how to present the research to non-experts and how to show case and sell the idea based on industry

fit and potential.

From the TTOs standpoint this WP educated the TTO that perceived TRL levels and expected TRL level outcome are fluid. As mentioned, the project team aimed to achieve a TRL 3/4 in this project but ended up with an application with a TRL2 based on experimental observations. The movement and change of TRL level are a fluid interaction between Researcher and Project leader and increasing speed of pivoting does not always result in an increase in TRL. The dialog with the researcher/research group is sometimes more important than for developing the current technology and more important for the potential development of new technology/applications.

WP3 learning outcomes.

The time extent of this WP (2 months) and physical placement of the researcher at the TTO allowed for a close dialog and collaboration between the TTO and the Researcher to create a plan for technology development. The use of a commercialization application to the RCN as a tool was ideal for the Project leader to mentor the Researcher. The application writing process enabled the possibility to evaluate and determine aspects of commercializing a technology originating from an academic research idea. Allowing an academic to write an application to the commercialization program from scratch is highly unusual, but through the process and through iterations within the TTO team the project was quality ensured, business models were discussed and tools for commercial development gone through to assess technology readiness It was also important to ensure a good communication of advanced science to people outside of the project/science.

The Researcher was responsible for writing the commercialization application to the Research Council and learnt how to structure, convey, sell the research idea in such a format. This is the first time a researcher has been allowed by the TTO to write a commercialization application on behalf of TTO. This work entailed evaluating the results from WP2, performing market research to identify market opportunities and key market players.
The project did not reach a stage where it was relevant to develop a business plan, however, in both WP2 and WP3, the Project leader and the Researcher discussed various ways to develop the technology in a later phase either as a service to existing market players or directly licensing the technology. The research group has learnt how to seamlessly integrate innovation-oriented work with more fundamental research activities. The success of the current project relies on two things: (1) the design of the project ("innovation sabbatical") (2) the actual research group involved.

Next step

The TTO will endorse these types of projects in the future, try to ensure funding for similar projects and continue its work to include such innovative work as work that also will ensure further academic credit.

Politically, the TTO will focus on the positives from this project and use researcher involved as a champion for the bridge between innovation and academia.

The innovation sabbatical as part of NMBUs own innovation strategy is now on the agenda. The research group think that this is a very good idea, because of (1) relevant training of "champions" & (2) the actual innovation that may come out.

Annex 3: revised Innovation matureness tool

HEI have well working Knowledge transfer	
HEI have well working IP policies	
Students have access to trainings in innovation and entrepreneurial development	
Staff have access to trainings in innovation and entrepreneurial development	
Innovation and entrepreneurship are a major part in HEI strategy	
Innovation and entrepreneurial objectives (KTO targets) are supported by a « wide range of public investment sources »	
Innovation and entrepreneurial objectives (KTO targets) are supported by a « wide range of private investment sources »	
There is a model for coordinating and integrating innovation and entrepreneurial activities across the HEI.	
There is a physical or digital platform for coordinating and integrating innovation and entrepreneurial activities across the HEI	
HEI senior management encourages and supports faculties and units to act for innovation and entrepreneurial work and sideline activities	
Utilization/innovation work and sideline activities are beneficial when staff applying for higher appointments and in assessment for salary.	
The HEI integrates research, education, and industry (wider community) activities to exploit new knowledge.	
The HEI is committed to collaboration and knowledge exchange with industry, the public sector and society	
The HEI is a driving force for entrepreneurship and innovation in regional, social and community development	
The HEI regularly assesses the impact of its entrepreneurial agenda	
Internationalization is an integral part of the HEIs entrepreneurial agenda	
Summary	

Statements have been designed so that you can rate them with points from 1 to 5. Points 5= Works very well in practice. 3=Implemented and in practice, 1= Does not work in practice. If it is "not applicable" at all put in N/A option instead.

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