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CIRCULAR ECONOMY BioBoosters

Boosting Circular Transition

Insights from BioBoosters

Edited by Anna Aalto

Jamk University of Applied Sciences

Boosting Circular Transition

Jamk University of Applied Sciences
Publications 350

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Abstract

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'BioBoosters – Boosting Circular Transition' project has offered a unique co-operation opportunity for nine regions with smart specialisation strategies aiming at circular transition of bioeconomy sectors, in order to offer to these territorial structures new and future-oriented development opportunities. The project connected these regional innovation systems across the Baltic Sea Region to a joint open innovation platform tackling business-driven circular transition challenges. After intense, international, and iterative two-year piloting, the BioBoosters are ready to share the conclusions on the lessons learned.

In this publication, we explore the relevance, efficiency, impact and sustainability of the BioBoosters hackathon model and the inter-regional co-operation supporting has been explored. The analysis is based on data and feedback from 18 challenge provider companies, nearly 100 mentored teams and over 500 industry and research specialists connected. From what makes this hackathon model impactful – to the added value of international network, this publication features the best practices of BioBoosters joint endeavour.

As the BioBoosters project is soon ending, it is clear for the partners that the collectively accumulated know-how on open innovation, circular bioeconomy paradigm and inter-regional smart specialization – the co-operation will continue to make an impact in the BioBoosters community for years to come.

Keywords: bioeconomy, hackathons, sustainable development, innovations, circular economy, open innovation, innovation systems

Theme 1

Building Blocks of the Successful Piloting

Foreword: Evidence-based Excitement – Insights from BioBoosters

Anna Aalto, Jamk University of Applied Sciences, Finland

Driven by challenges, fuelled by innovation, and mentored by experts, the BioBoosters hackathon process offers a turnkey service for circular economy transition.

This is the story of the 'BioBoosters – Boosting Circular Transition' project co-funded by the European Regional Development Fund through the Interreg BSR programme in 2023-2025.

In spring of 2022, a consortium of nine organisations across the Baltic Sea Region had completed the first milestone to implement inter-regional innovation co-operation for boosting circular transition of bioeconomy sectors in their regions. An application for a core project in Interreg BSR programme 2021–2027 had been submitted. The work to strengthen the innovation capacity of rural bioeconomy innovation ecosystems via inter-regional co-operation would be continued after a lengthy preparation process that had its roots in the RDI2CluB project (2017–2020) and subsequent extension project, ConnectedbyBiobord, that ended in the summer of 2021. (Kumpulainen & Aalto, 2025.)

The consortium of bioeconomy innovation hubs – connectors of their regional or national innovation ecosystems – had selected a joint path forward. This time with an explicitly business focused, bottom-up approach expected to effectively engage also the SMEs into the inter-regional smart specialisation co-operation platform. The consortium would jointly upgrade the demand-driven hackathon model designed in Jamk University of Applied Sciences. They would enhance the model with inter-regional co-operation and apply the open innovation expertise of the connected partners. The upgraded model would be piloted in two iterations with a total of 18 circular transition challenges from companies of the bioeconomy sectors. The consortium would set out to integrate the hackathon model into their regional innovation system – and to build a strategic alliance and operational model for long-term co-operation. (Kumpulainen & Aalto, 2025.)

Building Blocks for Impactful Co-operation

Now, three years later, the 'BioBoosters' are ready to share the conclusions, and the lessons learned. In this publication, the team that implemented 18 hackathons in two years explores the relevance, efficiency, impact and sustainability of the BioBoosters hackathon model and the inter-regional co-operation supporting it. As the project manager, I am immensely happy and relieved to see it has all come together in a manner that is matching, and partly exceeding, the high expectations and ambitious goals that we started out with.

Success is not a coincidence, of course. Apart from the hard work and dedication, the BioBoosters team has been blessed with excellent building blocks – extensive cross-sectoral network of networks, talented team with capacity for creative international team-working, as well as a proven open innovation model with clear value proposition and impact. Each partner has acted in their natural position as intermediary organisations of their regional innovation ecosystem. Moreover, the project has focused on challenges with relevance to the bioeconomy sectors and specific companies – and with concrete business and growth opportunities for innovators offering the solutions. These, and more, of the building blocks for successful inter-regional smart specialisation co-operation are explored in this publication based on the piloting experience. The articles in the opening theme of the publication will dive into the success factors of the pilot design and the unique value propositions of the hackathon model. Thereafter, we shift the focus to the findings of the evaluation.

Assessing the Long-term Viability

To carry an extensive evaluation of the project activities, the BioBoosters partners have collected data and feedback from 18 challenge provider companies, 120 mentored solution provider teams and over 500 industry and research specialists – the hackathon alumni. Furthermore, the iterative piloting and evaluation work has been continuously driven forward via collaborative knowledge-building in the international BioBoosters team of 30 specialists.

Purpose of the evaluation has been to assess the viability of the BioBoosters hackathon model in terms of its ability to deliver the value propositions set for each of the target groups as well as the potential to transition to a long-term operation beyond the project scope. To explore the viability, four evaluation criteria were set by the evaluation team: Relevance, Effectiveness, Impact and Sustainability. The articles in this publication are collected under these

four themes to highlight the outcomes of each evaluated criterion. (Olesiak, Sobolewski & Aalto, 2023.)

The 'Boosting Co-operation and Business Transition with a Hackathon' theme of this publication explores to what extent the BioBoosters hackathon model supports the role of an innovation hub as the connector of a regional innovation system. With the experiences from the nine innovation hubs involved in BioBoosters, the writers explore how the hackathons have supported the smart specialisation strategy implementation in the connected regions. In other words, writers outline the strategic role and position of the BioBoosters hackathon in the connected regions in terms of the smart specialisation strategies boosting the circular economy transition of the bioeconomy sectors in these regions. Moreover, the writers raise the question of whether the inter-regional BioBoosters hackathon model is responding to the needs for smart specialisation co-operation of the connected regional innovation systems.

Writers also hope to explore to what extent hackathon helps in delivering the objectives of the EU and Baltic Sea Region strategy documents relating to circular economy transition and sustainable bioeconomy development in the macro-region, such as (Olesiak et al., 2023.):

- making sustainable products the norm in the EU, ensuring less waste and making circularity work for people, regions and cities (EU Circular Economy Action Plan);
- reinforcing sustainability of agriculture, forestry and fisheries by promoting an integrated approach (EU Strategy for the Baltic Sea Region, Policy area Bioeconomy);
- learning from each other, also across the borders, to speed up spreading of new sustainable practices and productions in agriculture, forestry, blue bioeconomy (EU Strategy for the Baltic Sea Region, Policy area Bioeconomy).

Next, the **'Delivering the Value Propositions'** theme will explore how effectively the BioBoosters hackathon has delivered its value propositions to challenge providers, solution providers, mentors and organisers. In the co-planning phase before the piloting started, the partners compiled 'Value Proposition Canvases' for each of the target groups to understand their motivation to participate and their expectations for the process. The Value Proposition Canvases define what pains of the target group would be relieved and what gains could they expect to benefit from the participation to the

hackathon. Based on the evaluation data, it is time to assess where these expectations have been matched (Olesiak et al., 2023).

The 'Impact of BioBoosters' theme highlights the outcomes of the BioBoosters hackathons in the scope of the 18 challenges tackled in international network co-operation. Impact of the BioBoosters hackathons can be seen both as the launched RDI and business co-operation directly resulting from the hackathons as well as the building of an innovation community across the Baltic Sea Region to enhance a multitude of circular transition co-operations in the macro-region.

In the first article of the Impact of BioBoosters theme, the writers will outline the role of the BioBoosters hackathon as a launchpad for co-operation, studying the types of co-operation initiated. Although, the main expected outcome of each hackathon is a co-operation launched between the challenge provider company and the winning team, in practise the connections made, and co-operations initiated can be numerous and versatile. Article also dives into the factors affecting the success of the co-operation launch – and how much time the launch will take.

The second article will dive into the concept of the innovation community and how the development of a macro-regional innovation community has been initiated in the BioBoosters project. The statistics of hackathon participants and LinkedIn community members will offer insights into the potential of the BioBoosters community. The statistics show how the community is bridging research and business as well as connecting cross-sectoral and inter-regional expertise. Furthermore, the statistics demonstrate the loyalty of the hackathon alumni that provides a strong indicator of the international community's potential to develop beyond the project scope.

Finally, the **'Transitioning to Long-term Operations'** theme of this publication will provide answers to the pressing question of if there will be more BioBoosters hackathons in the future. The writers will explore the conditions, success factors and limitations, of integration of the BioBoosters hackathons model into the partner organisations and their regional innovation systems. The progress made with integration and the foreseen regional applications of the hackathon model and know-how are explored.

To conclude, the writers will provide an outlook to the future of the network. The jointly deliberated BioBoosters network vision and value proposition are shared giving insights into the next steps and objectives of the network. In the end of the project-based co-operation, the network is in the possession of several valuable and essential resources; the innovation community, recognized brand, communication channels and platforms, shared open

innovation process know-how and trusted partners. These are resources that every innovation hub treasures as a key premises for successful operations and service delivery to the connected innovation system. As the piloting ends, the focus shifts to the sustaining of these resources for the common use of the BioBoosters network.

Transitioning the co-operation from project-based to network-based is a common challenge not easy to tackle as available resources are often bound to project funding that is not well-adapted to continuous service delivery. BioBoosters vision entails approaches to bridge this gap; however, only time will tell if BioBoosters hackathons can continue in their current format or live on in countless adaptations and via the connections made.

Lasting Impact of the Project Era

'BioBoosters – Boosting Circular Transition' project has offered a unique co-operation opportunity for nine regions with smart specialisation strategy focused on circular transition of bioeconomy sectors. The project connected these regional innovation systems across the Baltic Sea Region to a joint open innovation platform tackling business-driven circular transition challenges.

On these pages, we have written down the discoveries made, and the capacity gained. From what makes our hackathon impactful to the added value of international network, this publication features the best practices of BioBoosters. Furthermore, we will share insights into how it was all done – from how the piloting was organised to the transition from project-based team working to network-based co-operation.

As BioBoosters – the project – is soon ending, it is clear for us that the collectively accumulated know-how on open innovation and inter-regional smart specialisation co-operation will continue to make an impact in the BioBoosters community for years to come.

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The Triple-win Formula of BioBoosters Hackathon

Anna Aalto, Jamk University of Applied Sciences, Finland

What comes to your mind when you hear the word hackathon? Maybe overnight coding? Or student teams learning design thinking? Cash prices? Problem solving in ad hoc teams? In fact, none of the above apply to the BioBoosters hackathon. What is the BioBoosters hackathon about then? This article explores the BioBoosters hackathon as an open innovation process and as a design process.

Let's Run through the BioBoosters Hackathon Process

What is BioBoosters hackathon? BioBoosters hackathon process can be divided into three main phases: 1) challenge formulation, 2) open call for solutions, and 3) solution development. In addition, there are four roles: the challenge provider, the solution provider teams, the mentors and the organiser. These roles are elaborated in the description of the main phases. For an organiser, the whole process naturally entails many more months and tasks than visible to the challenge provider, solution provider teams and mentors. Challenge provider is involved in the process from the start of the challenge formulation, while solution providers start their journey by sending in an application in the open call phase, and mentors enter via the kick-off webinar in the start of the solution development phase.

As shown in figure 1, the first phase, challenge formulation, is centred around of the understanding the need of a challenge provider company. Via discussions, desk studies and specialist consultations, the organiser of the hackathon together with the team of the challenge provider's specialists is defining what the challenge is about. This includes the scope of the challenge as well as the impact for the challenge provider company and for the wider industry, society and environment. In this stage, it is essential to understand what kind of co-operation opportunities the challenge provider company is open to explore to tackle the challenge. More specific questions involve, e.g. the willingness to co-operate with research teams or student teams having ideas in early low technology readiness levels, as well as capacity for international co-operation.

Figure 1. Challenge formulation. (BioBoosters)

To enter the open call for solutions, it is essential to understand the priorities of the challenge provider in terms of how they would evaluate solution options and what qualities and expertise they expect from teams. Challenge definition and target groups form a basis for making a clear communication plan with marketing messages, key words, teasers, visuals, and slogans. Having a clear co-operation offer to teams and scalable market potential for the solution are essential for a making an appealing open call for companies. The offer along with the target group information, evaluation criteria as well as hackathon process timelines and rules are combined to a 'hackathon invitation' promoted in the open call. This hackathon invitation is published online with a homepage managed by the organiser, and an open launch webinar is organised and promoted to engage key stakeholders and potential teams to start the open call phase.

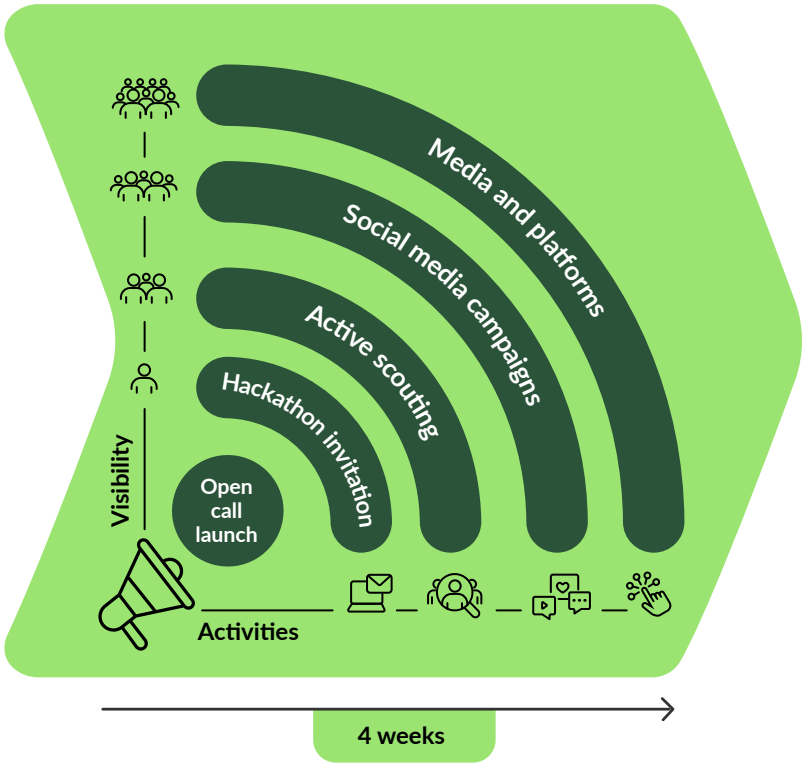

Figure 2. Open call for solutions. (BioBoosters)

The second main phase, the open call, consists of a marketing campaign and active scouting strategy implemented in a time period of approximately one month as shown in figure 2. The aim of the open call is to attract potential solution provider teams to join the hackathon process by submitting a brief idea of the proposed innovation and team description to an online survey. With the lead of the organiser, supported by potential co-organisers and the challenge provider, the marketing campaign and active scouting are carried out in line with a plan established on the basis of the targeted potential solution provider typesidentified in challenge definition. Communication is targeted to the channels and platforms relevant to the target groups. Active scouting involves searching for potential teams and mentors as well as contacting them directly to join the process. The active scouting task varies from word-of-mouth to networks and connections (or even colleagues) to 'cold calling' to new contacts based on web search. Organiser monitors the progress of the

marking campaign and active scouting to adjust the strategy if needed and to ensure adequate actions are taken to attract the solution provider teams.

At the end of the open call, the challenge provider company is studying the submitted applications and selecting the teams that they would like to work with in the final phase. To optimise the open innovation process, the recommended number of teams is 5–6; however, a drop-out rate of 10–20 per cent can be expected. The recommended number of mentors, including external mentors and specialists from the challenge provider team, is 10–15. Mentors should cover all aspects of the evaluation criteria, typically the technical and policy know-how relevant to the challenge, industry specific expertise, as well as business development and pitching guidance.

Now that all the participants are confirmed, it is time to sign the non-disclosure agreements and get to know each other – and to dive into further development of the innovative solutions presented by the selected teams. In this solution development phase (figure 3), the actual hackathon is started. The Kick-off webinar brings together the challenge provider, teams, and mentors to initiate the development interaction. At the Kick-off, the teams present their ideas and get feedback from mentors and challenge provider. They can also get more data on the challenge and the opportunity to ask questions to develop their idea and refine their co-operation proposal to the challenge provider.

Before the Hackathon days, the interaction and dialogue with mentors and challenge provider's experts is continued at a digital workspace. Finally, the hackathon days arrive with amble networking and co-working opportunities. Operated as a hybrid event, the hackathon days start with mentoring sessions for teams. Each team will meet with all mentors; typically, mentors will rotate all teams in pairs with 30 minutes time slots. Towards the end of the hackathon days, a pitching session is held where the teams will present their solution and co-operation proposals in 5–6 minutes. Thereafter, the jury will convene and select the winner(s). The event will be closed with the winners' announcement and final celebrations.

To guide their decision making, the jury can ask few questions from the pitch presenters as well as utilise the feedback and assessments of the mentors to guide their decision making. Jury members often also have engaged in the mentoring themselves, so that they have had an opportunity in the course of the process to discuss the co-operation possibilities with the teams in more details. This is naturally important prerequisite for meeting the aim of the hackathon which is to launch a co-operation between the winning team and the challenge provider.

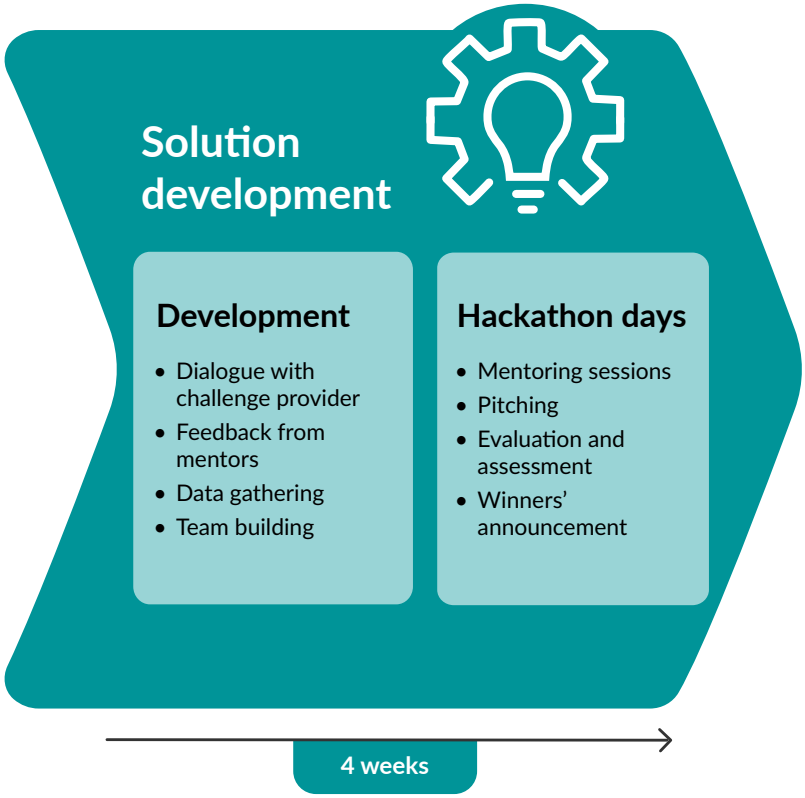

Figure 3. Solution development. (BioBoosters)

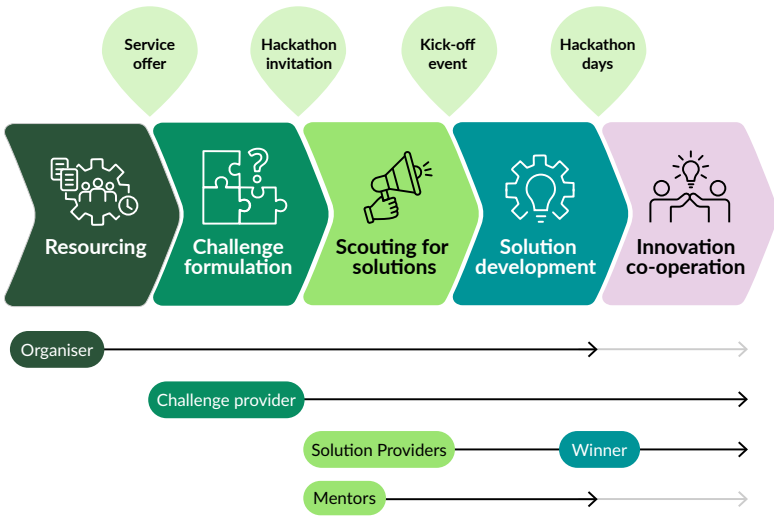

Figure 4. Hackathon process. (BioBoosters)

BioBoosters Hackathon in terms of Open Innovation – The Triple-win Value Delivery

> *Hackathons are not just about solving immediate problems but also about creating a better future. Believing in the potential of the solutions can inspire participants to think creatively and push boundaries. Foster an environment of optimism and forward-thinking. Encourage participants to consider the long-term impact of their solutions and how they can contribute to sustainability. – Katrin Kepp, Estonian University of Life Sciences (Kepp, 2024.)*

What is the value of the BioBoosters hackathon as an open innovation process? As introduced already in 2003 by Henry Chesbrough, open innovation refers to the ways that companies can generate and commercialize innovations by engaging outside entities (Kuan, 2020). The need for open innovation has since become increasingly acute as companies are facing ever-growing uncertainties and complexities in the global operating environment and among the sustainability crises. To remain competitive, capacity for rapid innovation is needed as indicated also in the recent study of Garrido-Moreno, Martín-Rojas and García-Morales (2024) elaborating the role of innovation and organisational resilience in improving business performance. Acceleration of innovation processes is best achieved in co-operation and via opening the innovation processes.

The study by Attalah, Nylund & Brem (2023) highlights the significant impact of open innovation through hackathons. These events bring together participants with diverse expertise from various organizations within the innovation ecosystem, achieving results beyond the capabilities of individual organizations' internal research and development activities. In recent years, hackathons have increasingly emerged as tools for addressing societal issues through open innovation, with diverse conceptual frameworks guiding their processes. Some hackathons focus on idea generation, while others, like BioBoosters, engage participants in collaborative learning and prototyping of ideas (Attalah et al., 2023, 275–276).

The BioBoosters hackathon is characterized by its company initiator, the challenge provider, who commits resources to help prototype viable ideas and further develop the winning idea through co-operation, either by implementing the solution within their operations or supporting its piloting and commercialization. Beyond the co-operation opportunity for the winner, hackathons focused on collective learning foster sideways open innovation, where ideas and co-operation opportunities arise from connections between

participants, not just the challenge provider (Attalah et al., 2023, 275–276). This enhances the value proposition for participating teams and mentors, making participation more attractive. The BioBoosters hackathon emphasizes networking, visibility, and learning value through cross-sectoral and inter-regional expertise exchange and interaction between industry and academic experts (Myhrén, Lehtomäki, & Aalto, 2023). This value capture has been observed in the hackathons organized by Jamk University of Applied Sciences since 2022 (Aalto, Iso-Ahola, Kumpulainen, & Kuula, 2023, 11).

In the context of open innovation, the BioBoosters hackathon model can be defined as a 'coupled' model, combining inbound and outbound innovation activities aimed at joint development or commercialization of innovations (Flor, Oltra-Mestre & Sanjurjo, 2021). The primary goal of the BioBoosters hackathon is to establish a mutually beneficial innovation partnership between the challenge provider company and the solution provider. Benefits may include co-designing a new product or service, establishing a proof-of-concept, or testing and demonstrating new technology. The open innovation process begins with inbound activities, such as sourcing and scouting talent, expertise, technology options, and innovative ideas. In the next phase, outbound knowledge flow is integrated, as the challenge provider's specialists connect with solution provider teams to mentor, guide, and support the development of the solution concept and innovation partnership proposal.

BioBoosters Hackathon in terms of the Design Thinking – from Loving the Problem to Delivering the Solution

Exploring the BioBoosters hackathon in terms of the design thinking offers further insights into the value of the process for developing solutions to address the needs of the challenge provider. Design thinking is a non-linear process that originates from the concept of Human-Centred Design. It can be effectively applied to address so-called wicked problems involving complexities, trade-offs and multi-disciplinary approach. The main idea is to uncover the hidden needs of target groups and develop solutions to address these needs. Practically, designers can apply this theory by evaluating solutions from three perspectives: desirability, technical feasibility, and economic feasibility. When all three criteria are met, the solution has the potential for success (Interaction Design Foundation, 2024). The BioBoosters hackathon process is addressing all the three criteria. There is always a challenge owner (desire) with a real need. Additionally, expert mentoring during the hackathon days helps develop the economic viability and technical feasibility of the proposed solution. When all

these elements are in place, it is natural to continue developing the solution. (Kumpulainen & Aalto, 2024.)

Furthermore, observing the double-diamond model of design thinking, we can see that the first diamond matches to the challenge formulation phase while the second diamond connects to the solution development phase of the BioBoosters hackathon. The double-diamond model presents a systematic approach to facilitate and cultivate creativity, relying on a process that involves the alternating use of divergent and convergent thinking. Divergent thinking is about exploring and expanding the realm of opportunities to generate multiple approaches and solutions. In contrast, convergent thinking focuses on refinement and reduction to identify the most efficient and effective approach. The design process proceeds in four phases, where the first two focus on the challenge, and the last two on the solution. (Shen, Bosch, Pino, & Gopalan, 2024.)

- Discover: insights into the problem
- Define: focusing the problem definition
- Develop: prototype, test and learn from group of potential solutions
- Deliver: solution that works

Correspondingly in the hackathon process, the challenge formulation phase is committed to understanding the challenge, exploring the needs of the challenge provider and the opportunities in wider context waiting to be grasped. Next, defining the hackathon invitation sets the baseline for the ideation and alternative approaches to solution that would meet the needs of the challenge provider and have the expected impact. As the teams are selected on board the hackathon, the prototyping and testing the ideas with the feedback and data from mentors and challenge providers can start. To present the solution, teams are capacitated with pitch training to help them articulate how they are responding to the needs of the challenge provider.

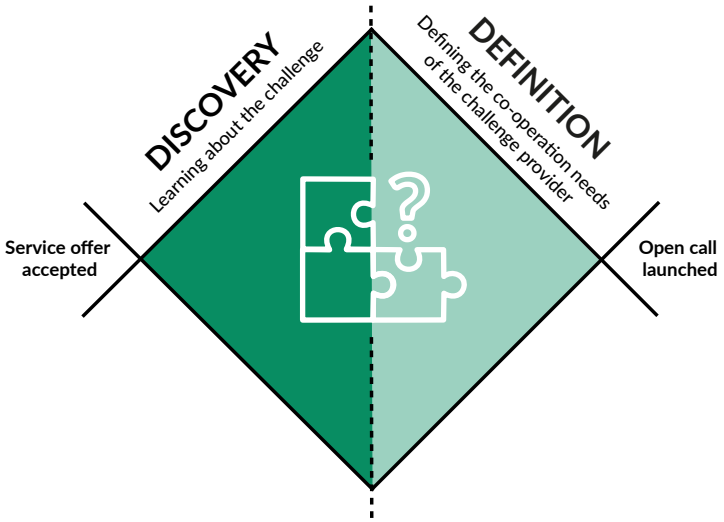

Figure 5. Challenge formulation in the framework of design-thinking. (BioBoosters)

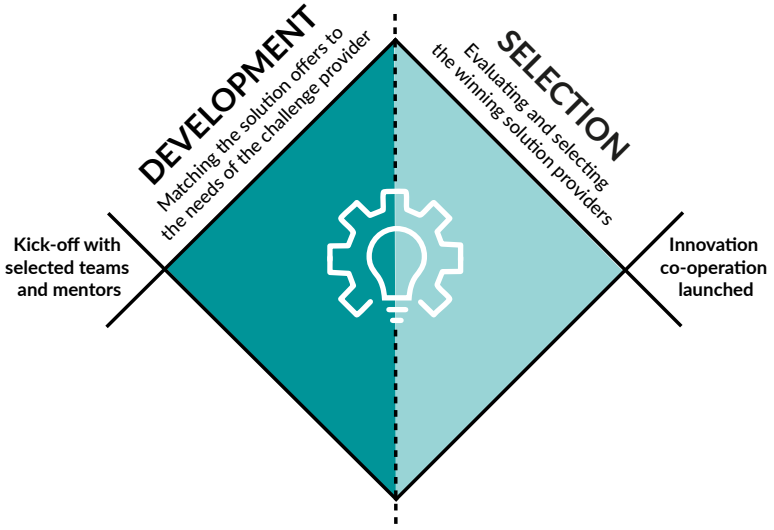

Figure 6. Solution development in the framework of design-thinking. (BioBoosters)

Along the BioBoosters hackathon path, there is a clear transition from problem awareness to solution awareness offered to the challenge provider as a turn-key process delivering dozen potential solutions via an international network of networks and a facilitated process for development of the solutions and selecting the most viable way forward.

But is it a Hackathon?

Whether hackathon is the best word for the BioBoosters open innovation process remains an issue brought to discussion every now and again. Not all associated perceptions of the hackathon (as listed in the introduction to this article) fit to BioBoosters model. However, there are many elements that fit.

The word hackathon has its origins in the rapid and collaborative development of new software technologies. In BioBoosters, we hack co-operation potential, not software. Our focus has been in the bioeconomy sectors; however, in many cases addressing needed digital solutions and smart technologies.

The process is not happening overnight but over a period of 2–3 months. However, no overnight event happens without preparation, and the hackathon days of BioBoosters do deliver the 24-hour intense co-designing experience (although our program offers the option of sleeping as well).

The BioBoosters hackathon competition is targeted primarily to companies as solution providers, especially growth-oriented SMEs, startups and research teams with commercialisation aspirations. Students are welcomed and have even won. A typical BioBoosters hackathon features great diversity in age, nationalities and backgrounds of teams which has been seen to boost creativity.

Also, what is not typical of hackathons is that our teams are not ad-hoc, but legitimate organisations or teams that have joined forces based on their own interest. The reason for that is that it provides clear ownership for the solution idea giving the challenge provider an easier time to initiate a co-operation to implement the solution after the hackathon (Kumpulainen & Aalto, 2024).

The BioBoosters hackathon process is built first and foremost to help launch a co-operation between the challenge provider and the team with the most potential solution and best capacity to deliver it. It is designed, tested and continuously upgraded to deliver value of networking, learning, and visibility to all participants. The process is geared to make an impact by delivering a solution to a sustainability challenge with implications on the level of individual companies, industrial sectors and society.

How would you call it?

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Collaborative Knowledge Building and Co-working in an Innovation Community

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BioBoosters hackathon piloting with 18 challenges from industry has been an intense collaborative learning process for the nine organisations that have worked together to organise these hackathons. Overall, the piloting process has set the framework for the results of the BioBoosters hackathon activities. The piloting team, and all participants of the hackathons, have shaped the results with their expertise and input.

It is not just the Destination, but the Journey

In this article, the journey of the piloting process is explored to outline how the BioBoosters team managed to deliver the 18 BioBoosters Hackathons as a collaborative effort of nine organisations. In terms of the BioBoosters project, hackathon organisers are both the implementers of the project activities and the beneficiaries of the capacity building. The experience of the organisers throughout the piloting process is naturally an important determinant of the future of the BioBoosters hackathon in their organisation and region. In addition, the article explores the success factors of the pilot process starting from the building blocks established early on as the team embarked on the two-year implementation phase to learn, upgrade and integrate the BioBoosters hackathon to their organisation and regional innovation system.

To paint a picture of the extend of the inter-organisational teamwork, let us outline how the piloting was organised. Overall, the BioBoosters team consisted of 20-30 experts from partner organisations with specialist know-how on business development, innovation processes, project management, circular bioeconomy, communication and marketing. Experts divided to two teams – hackathon team and communication team, both represented by all nine partners. Hackathon team oversaw the definition of the challenges, handled hackathon process management, as well as active scouting for prospective solution providersand mentors. Communication team was leading the design of communication materials as well as implementing the communication campaigns throughout the hackathon process.

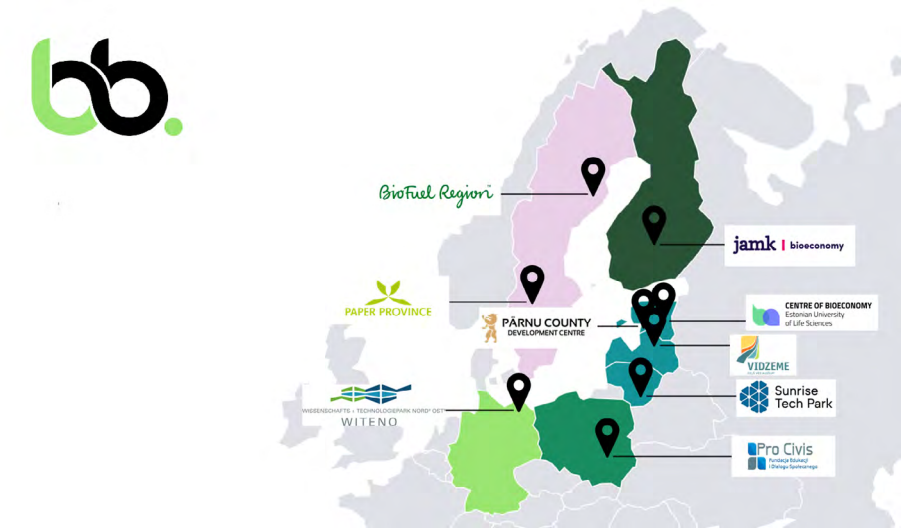

Image 1. BioBoosters has nine partners across the Baltic Sea Region from Sweden, Finland, Estonia, Latvia, Lithuania, Poland and Germany. (Image: Moa Jonsson)

The iterative piloting involved over 500 participants representing challenge provider companies, solution provider teams, mentors and organisers. Process was organised in four six-month periods over two years. Each autumn or spring, the hackathon team and communication team would collaboratively support4–5 open innovation processes each taking about 10–15 weeks from the definition of the challenge to the closing of the hackathon days. Co-working would be conducted online with weekly interaction between the partners. Continuous interaction was vital considering that there are over 50 tasks in the organisers' worklist for each hackathon and majority of these tasks require coordination, communication or co-working with the other organisers.

Outlining the building blocks of successful piloting co-operation involving teamwork across nine organisations and seven countries, this article will study three aspects of the pilot process that made the impressive results feasible: inter-organisational teamwork, digital facilitation capacity and setting clear targets.

The Obvious, but not Self-evident, Value of Co-operation

The piloting, quite like a hackathon, is a collaborative knowledge building and learning process where the experiences of the participants are reflected and

synthesized. Findings of one person are validated and enhanced by others – or given alternative explanations based on expertise and experience collected elsewhere. The co-learners jointly look for a common conclusion bridging their know-how from diverse backgrounds. This learning dialogue needs facilitation and guidance but can lead to a far more in-depth understanding than individual learning and reflection.

Implementing a development project with a team of specialists with diverse expertise and know-how from nine different organisations and seven countries involves a great potential for creativity and success. However, unlocking this potential means crossing barriers of diverse aims, working styles and languages; not only referring to the fact that none of the project team is conversing in their native language, but also to the diversity of meanings associated with terms and concepts. Information asymmetry is a common starting point in a diverse team which may lead to uncertainty within the team, ill-defined problems, and a temptation to free-ride – all hindering the ability to take advantage of the full capacity within the team. (Rekonen, 2017, 92–93.)

It has been clear throughout the piloting that there is strong added value in diversity in terms of offering a wider range of perspectives and points of view. For example, the design process benefitted from the bridging of experienced hackathon organisers and first-time organisers. To put it simply, the first-time organisers asked the most valuable questions. These questions revealed the missing instructions, as well as the points where the experienced organisers might have had different practices. The experienced organisers had their own implicit expectations of the hackathon process flow based on their earlier experience. When these different expectations were effectively revealed, the best practices to complement the unique BioBoosters hackathon process flow could be pinpointed and adjusted as a common process.

This aforementioned design dialogue would not been possible without a level of trust among the team. As stated by Rekonen (2017, 94), the quality of the teams' creative activities depends on how openly and freely the team members share their unique information building from their background and past experiences and bring up their points of view. It is equally important that the team members are willing to respect the points of view of others. Rekonen (2017, 96–97) proposes four cornerstones of unlocking the potential of diverse teams; 1) awareness of the spectrum of skills, knowledge and expertise in your team; 2) atmosphere that enables stepping out of one's comfort zone; 3) shared ways of working; and 4) systematic, positive and constructive feedback.

Trust, Respect, Structure, Safety and Fun – Creating the Perfect Combo for Teamwork

To set the BioBoosters team in the right track, we utilised the 'Team First-Aid Kit' developed in Passion-Based Co-creation project of Aalto University (Aalto University, 2024). The process involved getting to know the team members' skills and backgrounds as well as exercises to come up with the team working guidelines, a team agreement. Process involved few online workshops and team meetings; moreover, a joint study visit provided a valuable opportunity for face-to-face interaction and getting to know each other also in a more personal level.

The team agreement that we ended up with is nicely aligned with the aforementioned cornerstones of unlocking the potential of diverse teams. The team dialogue and group work results were organised to three principles accompanied with practical application guidelines. These principles are 1) trust and respect, 2) clear structure and responsibilities; and 3) safe and fun learning environment.

For BioBoosters team, trust and respect means in practice that everyone should always feel comfortable to voice their ideas, questions, and concerns. All questions should be validated with a deliberated answer. As time is the most important resource for all of us, the team felt strongly that everyone should respect given timelines and make an effort to respond in due time. Correspondingly, everyone strived to give realistic timelines for tasks – giving team members adequate time to deliver the results. Overall, BioBoosters team endeavoredto understand cultural differences, and to respect each cultures ways of working, innovating, and communicating.

Secondly, to establish clear structure and responsibilities, BioBoosters team set the following guidelines:

- Meetings are organized with clear agendas, agreed tasks are taken to the worklist and materials are open for discussion via Teams.
- All team members take the time to get prepared for joint activities by learning the relevant plans, guidance, and training materials provided.
- Joint worklist (MS Planner integrated to the Teams channel) is kept updated and tasks are clearly assigned with a timeline.
- Posts in Teams include clear action messages and tagging to target the message to the persons concerned.
- Clear instructions and guidance on how to use the joint communication platforms are provided.

Establishing clear structure and responsibilitiesmight at first sound like the easiest one to realise, however, in practice it turned out to be the most challenging. Matching this principle requires everyone's continuous and consistent effort amid the everyday multitasking and competing priorities commonly experienced in all innovation hubs due to the dynamic nature of their activities. Sometimes compromises are made in the internal communication efforts, and this can have an instant effect in the whole team.

Finally, the atmosphere, safe and fun learning environment, is essential building block for successful piloting. Safe learning environment was perceived as an environment where it is acceptable to also fail at times. When piloting a new process bridging multiple actors, many things can go wrong – or succeed in unexpected ways. If nothing more, there is a lesson learned. As summarized in the BioBoosters team agreement, the team wished to celebrate victories and to approach failures as a valuable learning experience.

Enabling co-learning and the open and honest sharing of experiences requires time and attention. The team hoped to take some time in meetings to connect with the participants and to address any arising problems or challenges by the team members. In the project implementation, it was seen important to find and offer opportunities for face-to-face interaction locally, bi-laterally, and on network level. To have fun together might not be an aim found in the project plans, but essentially it might be the best way to build trust, joint understanding, and long-term co-operation partnerships. In a team, having fun can connect us together, and also help us to work towards common goals.

Inter-regional Teamwork Lives on a Sound Digital Co-working Platform & Professional Facilitation

To achieve and implement the co-working principles, the digital co-working platforms of the team play a key role. Especially, the second principle demonstrates the importance of easy-to-use online communication tools and the co-working platforms. As a common barrier identified by the partners, it is typical that the team members will visit the platforms in different frequencies. Therefore, it is important to make sure needed information is easy to find and that the relevant tasks are easy to identify. Still, the team members that are more involved in the project usually adapt to the joint working practices better than the specialists that are less engaged in the team working. Facilitation and leading-by-example are needed. In practice, it can be a challenge to keep the internal management and monitoring tasks lean and effective while keeping the priority in the implementation rather than management. There needs to

be spaces for open development dialogue, but also the simple instructions helping implementation of individual's own tasks (in haste).

In BioBoosters, MS Teams with MS Planner have been the main tools for the task management. However, for the learning, reflection and creative co-working, the team has used Howspace – the platform also applied in the hackathons for development dialogue between the participants. Howspace offers good tools for the facilitator to plan and steer co-creation. Pre-scheduled and targeted messages, prepared tasks and workflows, co-working widgets and automated summaries support the facilitation and increase the transparency of the whole process which in turn encourage wider engagement to dialogue. All in all, setting up a discussion area does not result in a dialogue on its own – consistent facilitation is key. These observations are shared by the associated partner in the BioBoosters project, Kasvu Open, that is experienced in transitioning the live business mentoring events to online format in the aftermath of Covid-19 with the help of Howspace (Turunen, 2021).

To further summarise the success factors of online co-creation, a specialist of co-creation in the changing working environment, Antti Pitkänen, offers these guidelines that outline also the BioBoosters experience (Liimatainen, 2021):

- Define the target group. Who are we creating the service or process for? Involve the target group in the development dialogue.
- Define the targets. Everyone in the team needs to know what they are trying to accomplish.
- Engage the participants. Help the participants make the process personally relevant for themselves. Involve them in the design process.
- Communicate clearly and consistently… and frequently. Targeted to relevant team members or participants.
- Ensure quality execution. Take advantage of specialists and proven tools.
- Document results and ideas in real time. Summarise to help engagement.
- Keep developing. Make concrete aims supported by clear strategy – tasks and deliveries.
- Show respect. Make sure the team members feel that their contributions are appreciated and their points of views are heard.

Steering Performance with SMART and SAVE formula

In terms of setting clear targets for the team, majority of the key performance indicators defined for the piloting were related to the level of success in the target group engagement. The targets were easy to follow, for example:

- 10 applications per open call with 5 international applications (outside the hosting country of the organiser and challenge provider)
- Connect with a min. of 5 potential solution provider teams from your country and networks via direct contacting and collect their feedback on the open call.
- Engage 4 international (outside hosting country) mentors to the hackathon.

By focusing on these Specific, Measurable, Attainable, Realistic and Timebound (SMART) targets, the team was able to prioritise their work and focus their attention to the most value adding tasks. Although, the mentioned targets are very quantitative and do not directly show the qualitative value of the process, the successful target group engagement has resulted in impressive results also in feedback surveys (including NPS) from the target groups as well as exceeded outcomes in the numbers of launched business-driven research, development and innovation (RDI) co-operations from the hackathons.

As suggested by Desjardins (2021, 83), having SMART targets builds a strong cognitive framework for the teamwork; however, it does not address the motivational needs of the team. In other words, it lacks the definition of value and fails to answer why is this target important to us. Therefore, failing also to gain the engagement of the team to matchingthe targets. A SAVE formula addresses this motivational aspect to boost the team co-working results. To complement the 'Specific' and 'Achievable', the idea is to also define the 'Value' of the target and to have a chance to 'Elevate' own performance and skills. (Desjardins, 2021, 81.)

BioBoosters team's motivation has been consistently high which can be attributed to the perceived value of working on the real-life challenges and clients – and receiving systematically feedback from the target groups and peer team members. The tangible capacity building on a new process is consistent with 'Elevation' aspect of the SAVE formula. Gaining know-how, contacts and working in new capacities and roles has a significant personal motivation effect; especially when supported by a safe learning environment.

Takeaways of the Co-creation Marathon

- Take time from the start to build team-working capacity and trust; get to know each other. This investment will pay off in many ways.
- Take time to understand the needs of the target groups. Engage the target groups and stakeholders with relevant value propositions to make an impact.
- Have consistent co-working practices and define (and monitor the implementation of) clear practices for the use of communication and co-working platforms.
- Master the digital co-working with tools that support facilitation, co-learning and sense making.
- Make SMART but meaningful aims. Set targets that are easy to track and that the team can systematically work to accomplish. Make sure the aims matter and make sense for the team.

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Theme 2

Boosting Co-operation and Business Transition with a Hackathon

Hackathon as a Trusted Tool for Connecting, Unlocking and Discovering

Artur Sobolewski, PRO CIVIS Foundation, Poland
Lina Stanionytė, Sunrise Tech Park, Lithuania
Magnus Persson, Paper Province, Sweden
Anna Aalto, Jamk University of Applied Sciences, Finland

BioBoosters network includes cluster organisations, regional business support and development organisations, academy-based innovation hubs, science and business parks, and NGOs. How does a hackathon connect to the roles and strategies of these diverse organisations?

BioBoosters is a network of innovation hubs that act as connectors and innovation intermediaries or brokers in their regional innovation systems. Despite this common denominator, the partners are a very diverse group with origins in all the four quadruple helixes of the innovation framework – industry, academia, government, and civil society (Carayannis, Barth, & Campbell, 2012). In May 2025, the BioBoosters partners answered a survey to explore what benefits they have experienced as hackathon organisers – and how the hackathon organisation aligns with their organisation's strategic priorities. Based on the responses, the benefits and the role of the hackathon in connecting the regional innovation systems are explored taking into consideration various organisational profiles of the BioBoosters hackathon organisers.

Clusters Supporting the Clients and Regional Companies

> *By engaging in these hackathon activities, cluster members are not only able to outsource solutions and expertise to pressing environmental challenges but also gain international visibility as advocates for sustainability – Laima Balčiūnė, CEO of Sunrise Tech Park and coordinator of Cleantech Lithuania*

Let us start the exploration with cluster organisations as they represent the quintessential, industry-driven, connectors. As defined by Delgado, M., Porter, M. E. & Stern, S. (2013), a cluster is a regional ecosystem of related industries and competences that includes a range of inter-industry interdependencies. These groups of companies and institutions can jointly upscale their capacity of innovation and commercial competitiveness in the global markets under the

facilitation of a cluster organisation. Cluster organisations stimulate innovation activities and co-operation. A cluster organisation can boost co-operation within the cluster but also build strategic partnerships outside the cluster – and across clusters.

Cluster management organisations are represented in the network by Sunrise Tech Park and Paper Province; both acknowledged with the cluster management excellence labels by the European Secretariat for Cluster Analysis. Furthermore, BioFuel Region represents a cluster organisation as a member-owned non-profit company that is connecting the public sector, industry, and research in Northern Sweden. For a cluster organisation, hackathon can be seen as a 'Innovation as a Service' concept that adds value to all the members of the cluster. Let us explore this statement in the context of Sunrise Tech Park and Paper Province.

As one of the 62 Gold Label clusters globally, Paper Province has demonstrated its status as a front runner cluster organisation based on their role as a pivotal driver for the forest-based bioeconomy, with potential to significantly contribute to a more sustainable future (Åman, 2024). As reported by Magnus Persson, Project Manager from Paper Province, the cluster organisation can actively contribute to all of their core focus areas with hackathons – increased circularity, strengthened competence provision, and accelerated innovation. Through a structured and well-tested innovation process, Paper Province can help the over 120 member companies address real challenges—whether they relate to technology, sustainability, or business development. At the same time, the hackathon format opens the door to new competencies by involving researchers, start-ups, and SMEs that may not otherwise be connected to the region. This helps broaden the local innovation ecosystem and create new partnerships. In practice, the value created for the cluster was that both challenge providers that Paper Province worked with in the BioBoosters project were member companies. In addition, the winner of Moelven Hackathon, Billerud, is also a member. The challenge providers got many new contacts and ideas from all around Sweden as well as from other countries. Actually, the winning proposal for the challenge of Karlstads Energi came from Poland and they are now looking to establish themselves in Paper Province region. Furthermore, many SME members of the cluster have applied for and participated in the hackathons organised by the network.

Correspondingly, Sunrise Tech Park is a coordinator of the Cleantech Lithuania that connects clean technology companies, science and research institutions and other entities to support the national competitiveness and development of the cleantech sector. Cleantech Lithuania has 29 member

organisations including 20 SMEs (out of which there are 9 startups), five research organisations, and one large enterprise (Cleantech Lithuania, 2025).

As outlined by Lina Stanionytė, Project manager from Sunrise Tech Park, Cleantech Lithuania connects the main players in Cleantech industry in Lithuania and supports SMEs working in the field of circular economy and building climate-friendly solutions (in particular on renewable energy, transport, resource efficiency, environmental technologies and agri-tech). Two Cleantech Lithuania members – UAB Nando and UAB Toksika participated in BioBoosters hackathons as challenge providers. Both challenges aligned with the EU Soil Mission, aimed at improving soil health and removing harmful contaminants (European Commission, 2025).

The feedback from the Lithuanian challenge providers regarding the process and outcome was very positive, especially noting the increased international visibility of their activities and the new partnership opportunities. As noted by Gintarė Grybauskaitė-Kaminskienė, R&D Project Manager of UAB Nando, BioBoosters network facilitates international co-operation by connecting companies to tailored solutions and potential strategic partnerships cross-borders. Similarly, Marius Busilas, Development Manager at UAB Toksika, noted that BioBoosters hackathons are distinguished by their strong international reach and excellent organization, opening doors to meaningful and innovative collaborations.

By participating in BioBoosters hackathon, Cleantech Lithuania delivers value to its member companies by accelerating innovation, enhancing international visibility, fostering partnerships, and connecting them with cutting-edge solutions and expertise. The international hackathon model brings a wider variety of solutions and greater collaboration opportunities between research and business across Europe. The new co-operation broadens the scope of activities and allows interdisciplinary connections and synergies between cleantech and bioeconomy sectors.

Innovation Hubs Bridging Research and Industry

> *The BioBoosters model has demonstrated that aligning real-world challenges with open innovation, academic engagement, and strong mentorship can produce outcomes that are both practical and visionary. It promotes sustained collaboration, strengthens international networks, and empowers participants to co-create innovative solutions for a more sustainable bioeconomy. – Katrin Kepp, Head of the Centre of Bioeconomy, Estonian University of Life Sciences (Kepp, 2025).*

Partners from Jamk University of Applied Sciences and Estonian University of Life Sciences represent academy-based innovation hubs that have a role to foster co-operation between research, startups and industry in their region as well as on national level. Similar role can be identified for a science and business park, such as WITENO GmbH, which are boosting technology and knowledge transfer, by bringing together science and business. With a business-driven open innovation method that has a clear value offer for companies, and a clear role for researchers, these innovation hubs can foster dialogue between the academy and industry as well as raise their profile in the regional innovation systems.

As the hackathon model featured in the BioBoosters project was originally developed by Jamk University of Applied Sciences, the benefits of the hackathon activities have been explored already in a four-year framework. As described by Aalto (2025) and Palmgren et al. (2025), a bioeconomy business accelerator was established in 2020 to operate in conjunction with the Jamk's Institute of Bioeconomy and Bioeconomy Campus in Tarvaala, Saarijärvi. Hackathons soon became a flagship service for the accelerator with 15 hackathons organised in 2021–2023 by the accelerators' team. In 2025, the business accelerator of Jamk serves as a meeting place for actors in the Central Finland bioeconomy innovation ecosystem and facilitates co-operation with national and international bioeconomy innovation networks. Various innovation services and events, such as hackathons, the smart agriculture accelerator program, and AgriVenture Finland, support the development of innovative bio- and circular economy companies in Central Finland by offering networking opportunities and supporting the increase of R&D activities, in accordance withthe intelligent specialization strategy of Central Finland.

As Universities of Applied Sciences in Finland are mandated to build competences and competitiveness of the regional companies in line with the smart specialisation strategies – and a hackathon provides a business-driven process to carry out this regional development role. Accelerator activities, such as the hackathon, are key for connecting the applied research and teaching staff with the industry realities; and a good launchpad for co-operation and projects responding to the needs of the industry. All in all, the accelerator has helped to position Jamk as a regional innovation hub for the smart agriculture. (Aalto, 2025; Palmgren et al., 2025.)

Similar impact has been reported from Estonian University of Life Sciences, where 'Biomajanduse arenduskeskuse, BioMAK', Center of Bioeconomy, has been leading the hackathon activities based on their role as a dialogue and co-operation builder connecting researchers and students with the business.

According to Head of BioMAK, Katrin Kepp, the hackathons have significantly strengthened the role of BioMak as a regional innovation hub by fostering collaboration between startups, academia, and industry to co-create innovative and practical solutions in the circular-bioeconomy. For example, during the Fibenol Hackathon, participants explored high-value applications for cellulosic sugars, lignin, and specialty cellulose— by-products of wood processing— resulting in innovative concepts for sustainable food and feed ingredients. Similarly, the Nordic Hemp Hackathon brought together international teams to valorise hemp by-products. The winning team, Revoltech from Germany, developed a biodegradable, plastic-free leather alternative from hemp fibres and dust, offering a scalable solution for the fashion and automotive industries. Moreover, Kepp reflects that the hackathons have enhanced the visibility and credibility of BioMAK as a connector in the regional innovation ecosystem. In fact, BioMAK has taken the position as the primary ”go-to hub” for sustainable development in the region.

The outcomes of Cosun Beet Hackathon and the subsequent, AdFiS Hackathon, give a clear testimony to the role of German WITENO GmbH as a connector of science and business. In both of the hackathons, two research groups were among the winners; hence, in total four co-operations were started between research groups and the challenge provider companies in Germany. According to Gudrun Mernitz, the Project Manager fromWITENO GmbH, the Cosun Beet Hackathonhas resulted, for example,in follow-up co-operation including planning of a joint prototype development and EU project proposals.

Leading the Regional Circular Bioeconomy Transition

Public authority partners such as Vidzeme Planning Region, and Pärnu County Development Centre are promoting economic development and business opportunities in their geographical region based on the place-based strategies. Similarly, non-governmental organisation, such as PRO CIVIS Foundation play a role in regional development by supporting mission-oriented industry transition in their operating area. Whether place-based or mission-based, the role to lead a business transition and to boost the competitiveness of industries can be supported by hackathons. Let us explore few examples.

For the Latvian Vidzeme Planning Region, promoting economic development and growth by transforming economic models through the introduction of the assumptions of circular economy and / or bioeconomy is one of the main strategic goals set in the Vidzeme Regional Development

Programme for 2022–2027. As outlined by Inguna Kucina, Project Manager from Vidzeme Planning Region, organising the BioBoosters hackathons has helped Vidzeme Planning Region to connect large enterprises of the region to start-ups, research institutes and SMEs, both locally and internationally – ensuring exchange of knowledge and arranging for possible networking opportunities. The hackathon topics helped to support implementation of the regional smart specializations and influenced the setting of goals for further economic development in other regional planning documents.

Another example from Estonia as explored by Svea Uusen, Project manager at Pärnu County Development Centre, the Piesta Hackathon, held in Pärnu County in May 2025. This hackathon responded directly to the challenges outlined in the West-Estonia Smart Specialisation Strategy—chiefly the need to support sustainable food systems, bioresource valorisation, and the green transition. But while policy ambitions are clear, the regional reality, especially for small rural producers, is more complex. SMEs like Piesta Kuusikaru Farm produce valuable side streams such as apple pomace but lack the scale and technical resources to turn them into new products or income streams. Their situation reflects a broader regional pattern: small rural companies are too small to act alone, even when they sit on untapped circular economy opportunities. Hence, while offering insights into the case-specific solutions, the Piesta hackathon also helped in understanding the realities and practical barriers of valorising side streams of rural small and medium sized companies, SMEs. These lessons for the regional business support organisation may go a long way in designing the supportive processes and services to boost rural circularity.

International Innovation Brokerage Strengthening the Rural Innovation Systems

Staying with the case of Piesta Hackathon, let us also explore the strength of the hackathon as an international innovation brokerage service. Piesta Hackathon brought together five teams from Estonia, Finland, Sweden, Germany and Poland, working intensively over two days, guided by mentors, to propose business-ready solutions for the SME operating in Pärnu. Crucially, the hackathon was kickstarted by a joint ”Apple Hack” opening webinar—a unique co-organised session between the Piesta Hackathon in Estonia and the Refal Hackathon in Poland. Keynote speakers and researchers from both countries shared insights on the challenges and potential of apple pomace valorisation. This cross-national opening not only inspired participants but

also anchored the event in a broader European learning community. Mentors and industry experts from both Estonia and Poland then cross-pollinated between the hackathons, advising teams and helping to build bridges for future partnerships and shared projects. Even cider producers from Latvia with corresponding side-streams took part in the process as mentors. All in all, the process was elevated from a local innovation action to a transnational one. These types of international connections are especially important for strengthening the innovation capacity of the rural innovation systems as testified by Pärnu County Development Center.

As a long-term hackathon organiser, BioBoosters by Jamk, can provide further evidence to the internationalisation impact of the network co-organising model. Already prior to the BioBoosters network involvement, international participation has added value to the open innovation process of the business-driven hackathons at Jamk University of Applied Sciences where successfully opted. For example, international winner from Estonia was found in the KemiraHackathon organised in 2022 to find digitalization and platform solutions to a renewed and sustainable chemical industry (Jamk University of Applied Sciences, 2022). In the spring 2023, the GasumHackathon focusing on harnessing the biogenic CO2 from biogas upgrading to value adding applications gained a high international participation with a timely topic and well-recognised challenge provider. The open call attracted applicants, and eventually finalists, from five countries resulting in two winners – one from Finland and one from Norway. (Gasum, 2023.) International networks and platforms played a key role in this success. Co-organiser, Finnish Biocycle and Biogas Association, was able to leverage the communication channels of European Biogas Association (EBA) which was identified as the source for most international solution provider teams. At the same time in spring 2023, the open call for DataSpace Hackathon was organised to develop new business from food chain data and fair data economy. This open call was also running both in Finnish and English. However, the call for solutions attracted only one international team from Sweden demonstrating the struggle of attracting international teams in the absence of the right partners or co-organisers (Jamk University of Applied Sciences, 2023).

Apart from the success of attracting international teams, the overall number of applications has increased notably in the BioBoosters hackathons organised in the network co-operation connecting the Baltic Sea Region. All in all, comparing the open call outcomes of the hackathons organised at Jamk University of Applied Sciences without the BioBoosters network involvement, the numbers of teams attracted to open calls has practically

doubled. The average of applications received for BioBoosters hackathon in the scope of the joint project is 14 – with the range of 7–25 applications. In the international hackathons, also the number of international winners has exceeded the national ones. Compared to the few international winners in nationally organised hackathons, the BioBoosters network have delivered 13 international winners – almost 60 per cent of all winners. This showcases the exponential effect of connecting several innovation ecosystems together compared to operating in one system.

Initiating Development Projects with Relevance

All of the connectors of regional (and rural) innovation ecosystems are mobilisers of projects – regional development projects supporting the competitiveness and green transition of the regional business sectors. This is a key role shared by the BioBoosters network members. Therefore, the questions is posed – can the hackathon be deployed to generate new and innovative ideas for development projects? What role could the hackathon play in finding suitable partners? Is there a role for the hackathon to play also during developing projects proposals? The plain answers to all the three questions are – yes!

The regional authorities who are responsible for improving exactly the areas of the social, economic, and environmental well-being of communities in the region shall be strongly interested in strengthening the impact the given smart specializations exercise on the development of the region. At the same time there is a danger that the authorities will be inclined to circle around the same patterns and ideas, characteristic for the political approach, like creating new or improving the well-known structures like consortia or clusters. But at the same time, there is likely to be an actual demand for new and innovative projects contributing, maybe even in an unorthodox way, to the reinforcement of the given smart specialization and its actual influence on the regional development. And this is the place and the moment where the hackathon model may or even shall be employed.

One of the common weaknesses of the regional development is the closed circle of entities working on the agenda and on the individual topics. Introducing hackathon as the open innovation method for generating development projects allows inviting to the process new talents and new expertise. The hackathon's organizer will try to reach out to the networks it participates in, as well to those known and closely connected to the given subject.

Taking the exemplary hackathons of potential interest to the regional authorities, these could be networks having competencies and resources

in the substantive areas of circular bioeconomy, like agriculture, agri-food sector, forest industry, as well as in the topics of economic frameworks, social innovations and communication strategies. It seems natural that the hackathon's participants coming up with the actual solutions to the presented challenges – will also become the obvious candidates / partners in the upcoming development projects.

Once the ideation procedure for the development project has been finalized, the actual conceptualization and writing of the application starts. In this phase(s) there could also be areas for hackathons to be deployed. Such applications are evaluated based on the innovativeness of general project idea, but also on the ingenuity of individual project's elements, like for example the impact of the proposed solutions on the environment or on the well-being of individuals. These individual project's elements could also become challenges looking for the solutions within the frameworks of hackathons.

Conclusion: Multifaceted Roles, Lasting Impact

BioBoosters hackathons did not just solve challenges of bioeconomy sectors, they transformed the organisers themselves. Whether acting as connectors, strategists, facilitators, ecosystem builders, or knowledge brokers, each organization expanded its influence, deepened its capabilities, and strengthened its position in regional and international innovation landscapes.

These evolving roles demonstrate the power of challenge-driven innovation to not only solve problems, but to reshape institutions, build ecosystems, and drive strategic change across Europe's circular bioeconomy frontier.

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Regions Co-operating for Implementation of Smart Specialisation Strategies

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This article explores the experiences of the BioBoosters network on the regional development impact of the international open innovation process. How can a hackathon support implementation of smart specialisation strategies?

In the BioBoosters project, nine regions across the Baltic Sea set out to apply an international open innovation process in collaboration to boost the circular transition of the bioeconomy sectors in their regions. As demonstrated in this article, the circular transition of the bioeconomy sectors is aligned well with the smart specialisation strategies of the connected regions. Simultaneously, the BioBoosters hackathon model proved to be fit for purpose to boost the implementation of these strategies. Circularity is a Strategy for Sustainable Growth in Bioeconomy

In this article, the authors explore how the 18 hackathons implemented by the BioBoosters network responded to the strategic priorities of the represented regions. Outlining the challenges tackled in the hackathons and their alignment with the regions' smart specialisation strategies showcases how the hackathons can boost the development of businesses being of strategic importance for the regions.

In line with the EU regional policy, national and regional governments are encouraged to develop their place-based competitiveness and to guide the research and innovation actions with a Smart specialisation strategy (S3). Smart specialisation is a place-based approach; hence, it builds on the assets and resources available in the region. Its aim is to prioritise investments and innovation actions to concentrate limited resources to the areas with most potential for development of nationally or even globally competitive business. Smart specialisation should not be a top-down activity, but its implementation requires stakeholders from the quadruple helix (public sector, research, private sector and civil society) to engage throughout the strategy-cycle. (European Commission, 2025.)

As explored by Foray, Eichler, & Keller (2021), smart specialisation strategies are important tool in the EU scale for driving the sustainable and smart economic transitions of industries and sectors, with the aim of developing greener and more circular and digital businesses. Furthermore, it must be emphasised that the circular bioeconomy paradigm is strongly related to the regional conditions and local development. A key resource for a circular bioeconomy is biomass, which is grown locally, with cultivation and management strongly depended on regional contexts, including:

- Prevailing agricultural practices.
- Forest management.
- Specific environmental conditions.
- Local responses to climate change.

Biomass supply is highly dependent on place-based actors, such as individual farmers and forest owners. This points to the need to deploy the bioeconomy at a regional and local level and to promote bio-based circularity at spatially close scales. Therefore, the circular bioeconomy needs to be understood also as a regional task, with vital importance first and foremost for the rural regions. These assumptions have been highlighted inter alia by the Polish Strategic Plan for the Common Agricultural Policy for 2023–2027, approved by the European Commission on 31 August 2022 (Ministry of Agriculture and Rural Development, Republic of Poland, 2022).

Vanhamäki, Rinkinen and Manskinen (2021) have studied how circular economy has been concretised in the smart specialisation strategies of 12 European regions. As outlined in the study, effective implementation of the smart specialisation strategy requires a genuine bottom-up participation and concretisation of the regional action plans with measurable targets and indicators. Both aspects are lacking full implementation in many regions. Without practical activities connecting the regional entrepreneurial bases and innovation activities, the smart specialisation strategy, including the strategic drive to circular transition, remains only a regional branding effort. (Vanhamäki, Rinkinen & Manskinen, 2021.) Let us explore how the hackathons have supported crossing these aforementioned barriers.

For the analysis of regional impact of BioBoosters hackathons, the partners were surveyed on the importance of the three main thematic areas of circular bioeconomy that have been featured in the tackled 18 challenges. They are:

1. Valorisation of biological side-streams and development towards multi-output production chains (biorefineries).
2. Sustainable and resource-efficient use of bioresources via application of smart technologies and digitalization.
3. Discovery of biobased ingredients, materials and products to boost the transition to bio-based industries.

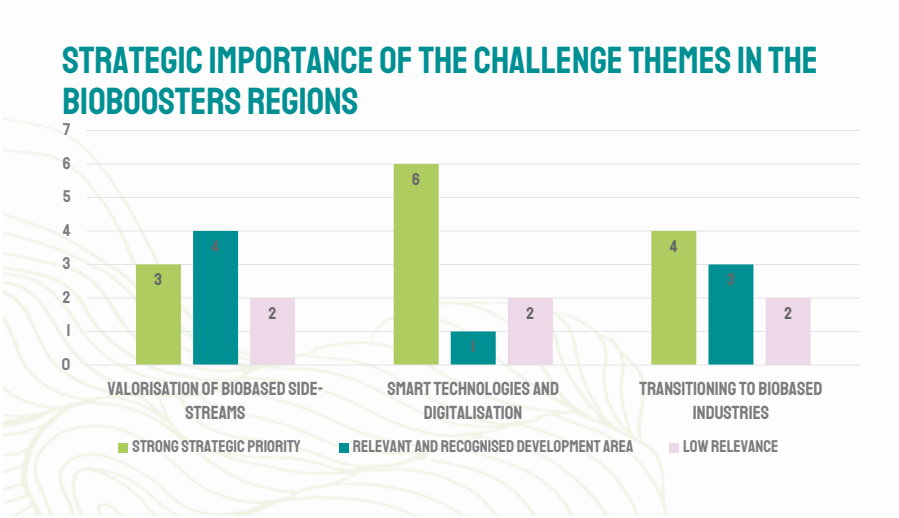

Figure 1. Strategic relevance of the BioBoosters hackathon challenges in the Bio-Boosters regions.

The survey provides an outlook of the relevance of the whole 18 challenges to each individual region. As the regions have had control only for selecting two challenges, it is important to understand how well the hackathon activities in the network also resonate across the regions. Figure 1 shows that all three themes are recognized in the regional strategies of seven regions giving relevance to all themes. Still, it is worth noting that smart technologies and digitalisation as a means of sustainable bioeconomy development seems to be the most prioritised theme in the network.

Smart Agriculture Knowledge Hub Developing in Central Finland

Circular and bioeconomy is one the Smart Specialisation spearheads of the Regional Smart Specialization Strategy in Central Finland (Regional Council of Central Finland, n.d.). The strategy outlines circular business models and digitalization as the main growth engines and the most important development areas of bioeconomy. The strategy is also naming concrete areas of circular and bioeconomy, which are of particular importance for the development of the Central Finland region. These are in particular:

- Sustainable materials and technologies substituting processed products, chemicals and other products such as oil, plastics and cement processed products.
- Cotton and textile fibres replacing synthetic materials.
- Biogas production and distribution.
- Wood construction and wood products.
- Circular solutions for biological and technological materials.
- Active and sustainable food production.

All the three thematic areas of circular bioeconomy transition tackled in the BioBoosters hackathons have ”strategic priority and strong regional emphasis” for Central Finland highlighting the potential of BioBoosters network to boost the innovation capacity of the region. In line with the strategic focus of the region, and the Institute of Bioeconomy, the hackathons organised by Jamk University of Applied Sciences focused on the digitalisation and smart technologies in the agri-food chain. Challenges of globally operating dairy producer, Valio Ltd., and logistics operator of the biogas value chains, Kuljetus Tero Liukas Ltd., connected most notably to the dairy production value chains that are key priority for the Northern Central Finland agriculture (Iso-Ahola & Aalto, 2024; Aalto, 2024).

Challenges also connect closely to the development of the smart agritech knowledge hub and test-bed at the Bioeconomy Campus to tackle the digital transformation of agriculture by developing a climate-smart innovation hub in Northern Europe. In partnership with Valtra, AGCO Power, Neste, and local stakeholders, the initiative tests and showcases smart farming technologies to boost sustainability and profitability. Central to this ecosystem is Jamk’s BioBoosters accelerator, which fosters a global startup community focused on agritech and bioeconomy. (Iso-Ahola & Aalto, 2024.)

Swedish Regions Mastering Sustainable Forest-based Bioeconomy

BioBoosters partnership involves two Swedish regions both with a strong focus on forest-based bioeconomy in their smart specialisation strategies. Globally recognised forest-bioeconomy cluster, Paper Province, is situated in North-Central Sweden, while BioFuel Region is a cluster organisation based in northern Sweden, working with bioeconomy and sustainable transports in a national and European context.

The forest industry and therefore a significant part of the forest-based bioeconomy are characterised by conservative patterns and a need for technical and mental movement. Smart specialisation should contribute to this transformation. An important strategic intention within smart specialisation is therefore to strengthen the conditions for attracting a broader competence base in terms of individuals and knowledge. An important direction for smart specialisation is also to strengthen the industry's conditions for taking advantage of the opportunities of digitalisation and creating new products, materials and services. The vision of circular bioeconomy within forestry shall be ensured in particular through a balanced development of the best products from forest raw materials (materials, prototypes and services) with higher added value; the circular value chains; and biodiversity initiatives and value creation from different uses of the forest.

In the Regional Innovation and Smart Specialization Strategy for the North-Central Sweden region there are three areas connected to the substantive features of circular economy and bioeconomy (Region Värmland, n.d.):

- Forest-based bioeconomy.
- Advanced manufacturing.
- Sustainable food systems.

There are also several cross-sectorial platforms and one of them is circular economy. All the three thematic areas of circular bioeconomy transition tackled in the BioBoosters hackathons have ”strategic priority and strong regional emphasis” for the North-Central Sweden region. Comparing to the mentioned North-Central Sweden region, circularity is not equally highlighted in the Regional Innovation Strategy 2020 – 2030 for Northern Sweden, despite the matching emphasis on forest bioeconomy (Västerbotten Region, n.d.). The three thematic areas of circular bioeconomy transition tackled in the BioBoosters hackathons are not explicitly mentioned in the strategy and could be characterized as having ”low relevance”.

The hackathons organised by Paper Province Economic Association, i.e. Moelven Hackathon and Karlstads Energi Hackathon, contributed strongly to the strategical priority of ”discovery of biobased ingredients, materials and products to boost the transition to biobased industries”. In Moelven Hackathon, two member companies of the Paper Province cluster connected to start a partnership to develop a new biobased packaging material for the wooden panels of Moelven (Hildén, Myhrén, & Persson, 2024). In the Karlstads Energi Hackathon, new value chains established around natural cork recovered from municipal waste were explored resulting in international winner – ReKorek from Poland (Hildén, 2025).

Meanwhile, the hackathons organised by BioFuel Region contributed to the themes of ”valorisation of biological side-streams and development towards multi-output production chains (biorefineries)” (Holmen Hackathon) and ”smart technologies and digitalization for sustainable and resource-efficient use of bioresources” (Skellefteå Kraft Hackathon). Holmen Hackathon addressed the challenge of finding sustainable and innovative uses for wood ash, which is a by-product from the biofuel boilers created during the heating and drying of wood (Fridman, Norberg, Jonsson, & Paananen, 2024). Skellefteå Kraft looked for digital solutions for tracking the stack of the biomass piles (forest-based residues), which are used for producing, selling and delivering energy and energy-related products and services (Fridman, 2025).

It is also worth to note that Paper Province Economic Association has introduced the BioBoosters hackathon model as a bridge building service to enhance Swedish – Canadian co-operation in the forest bioeconomy innovations. First and foremost, the aim is to improve the matchmaking between Nordic solutions and Canadian challenges—making the process more targeted and effective than previously used formats. As the hackathon model has also already been used in an activity jointly pursued by Norway, Sweden and Canadian cluster organizations, it can be concluded that the inter-regional co-operation capacity of North-Central Sweden region was also improved. This benefits the member companies and the forest-based bioeconomy sector as a whole.

Vidzeme – The Forerunner Region for Smart Rural Bioeconomy

The Vidzeme Planning Region Smart Specialisation Strategy 2022-2030 envisages, in accordance with the EU Green Deal, transition to a circular economy by reducing the consumption of raw materials and limiting to a

minimum the generation of waste. Seven priority economic sectors for smart specialisation have been determined in the strategy, out of which six could be strongly influenced by circular bioeconomy assumptions (Vidzeme Planning Region, n.d.):

- Wood processing.
- Production of food and beverages.
- Forestry.
- Agriculture (including animal husbandry).
- Production from renewable resources.
- Blue bioeconomy (including fisheries).

Out of the three thematic areas of circular bioeconomy transition tackled in the BioBoosters hackathons, two, i.e. ”discovery of biobased ingredients, materials and products”, and ”smart technologies and digitalization for sustainable and resource-efficient use of bioresources” have a strategic priority and strong regional emphasis for Vidzeme. At the same time the valorisation of biological side-streams and biorefineries is classified as relevant and recognized development area.

The hackathons delivered by Vidzeme Planning Region, i.e. Alojas Hackathon and Stora Enso Hackathon, connected with the theme ”smart technologies and digitalization for sustainable and resource-efficient use of bioresources”. The challenges resulted in access to market ready solutions via inter-regional connections strengthening the position of Vidzeme region’s inter-regional co-operation capacity.

The first of the BioBoosters hackathons organized by Vidzeme Planning Region, i.e. Alojas Hackathon dealt with the employment of ”smart technologies and digitalization” while producing food raw materials (Kucina, & Riekstiņa, 2024). The second – Stora Enso Hackathon focused on delivering innovative, eco-friendly solutions to combat the dual threats of blue stain in sawn logs and wood-damaging insects without increasing water consumption and was related to the strategical priority of ”sustainable and resource-efficient use of bioresources” (Kucina, 2025). The first of the challenges could be assessed in relation to the smart specialization of Vidzeme region as constituting ”relevant and recognized development area”, with the second occupying ”strategic priority area with strong emphasis”.

Maximising Biobased Innovation Potential in Tartu

In the Tartu Region, Estonia, the circular economy and the bioeconomy are very prominent represented in the Tartu County Development Strategy 2040 (Tartu County). The smart specialization areas in question are:

- Circular economy with focus on reducing waste and emissions, especially in food systems and nutrient recycling.
- Bioeconomy with emphasis on sustainable use of biological resources, innovation and digital tools for rural businesses.
- Agriculture & food with support for local, organic food systems and the connections of farmers with public institutions.
- Forestry & bioenergy understood as encouragement of sustainable forest use and biomass-based energy solutions.

As the exemplary initiatives in these regards, the following projects could be named: ”CiNURGi – nutrient recycling from biomass”, ”eRural Resilience – digital support for rural bio-based SMEs” and ”Circular Food Shift – redesigning food systems for sustainability”. (Interreg Baltic Sea Region 2023a; 2023b; 2023c).

All the three thematic areas of circular bioeconomy transition tackled in the BioBoosters hackathons have strategic priority and strong regional emphasis for the region of Tartu that highlights the strategic relevance of the BioBoosters network activities to the regional development strategy. According to Estonian University of Life Sciences, the hackathons have also significantly strengthened the Tartu region’s inter-regional co-operation capacity, as the BioBoosters approach has proven highly effective in connecting regions with complementary strengths and fostering long-term partnerships. Through repeated implementation of the BioBoosters model, the Tartu region has built strong internal capacity in facilitating challenge-based innovation, developed a regional pool of mentors and experts, and gained practical experience in managing multi-actor, cross-border collaboration. As a result, the region is now recognised beyond county borders as a trusted innovation partner, with neighbouring and international regions increasingly seeking to collaborate on circular bioeconomy initiatives.

In fact, both hackathons organised by the Estonian University of Life Sciences contributed to launching international co-operation of strategic importance to the development of competitive biobased industries in Estonia. The Fibenol Hackathon attracted stakeholders from across the Baltic and

Nordic regions to explore high-value uses for wood-based side streams, sparking new cross-border R&D initiatives and EU funding applications (Kepp, Veesaar, Liiv, & Aalto, 2024). Similarly, the Nordic Hemp Hackathon united teams from Germany, Finland, and Estonia to co-develop solutions for hemp by-product valorisation. The German winning team, Revoltech, introduced a hemp-based leather alternative, which has since led to continued cooperation in sustainable materials innovation. (Kepp, 2025.)

Zooming into Rural Circularity in Pärnu Region

The development strategy ”Pärnuma 2035+” outlines smart specialisation areas connected to the circular economy and bioeconomy (Pärnu County). The main goal is to strengthen regional competitiveness by promoting a knowledge-based sustainable use of natural resources. The relevant smart specialization areas are:

1. Bioeconomy and renewable energy, with the emphasis on efficient and sustainable use of bioresources, such as agricultural products and forest materials.
2. Circular economy, with the intention of convincing companies to implement resource-efficient solutions and circular economy practices in order to reduce waste and increase material reuse.
3. Community energy, with the focus on developing community-based energy solutions and on encouraging local communities to produce and consume renewable energy, such as biogas solar power.
4. Agriculture and food systems, with the attention to the improvement of food production efficiency and to the promotion of short supply chains that reduce environmental impact.
5. Forestry and bioenergy, with the focus on sustainable forest management and the use of wood as a renewable energy source, in order to support regional energy independence and economic growth.

All these areas are interconnected and support West-Estonia regional ambition to become a model for sustainable development and green technologies, while enhancing the wellbeing and economic resilience of local communities. The

thematic areas of circular bioeconomy transition tackled in the BioBoosters hackathons are relevant to the strategy with ”sustainable and resource-efficient use of bioresources via application of smart technologies and digitalization” having a strong emphasis.

The two BioBoosters hackathons organised by Pärnu County Development Centre contributed strongly especially to the strategical priority of ”valorisation of biological side-streams and development towards multi-output production chains (biorefineries)” with interconnected impact to the other themes. Organised in spring 2024, Võiste Hackathon tackled a challenge of delivering new technologies and innovative solutions for the valorisation of biomass being the result of tomato production (Uusen, & Knuuttila, 2024). In the following spring, Piesta Hackathon dealt with a very similar challenge. Piesta Kuusikaru OÜ was looking for sustainable, scalable, and financially viable solutions for the valorisation of apple processing by-products at the end of the value chain (Uusen, 2025).

Assessing the overall strategy relevance, both challenges are considered strongly connected to the West-Estonia Smart Specialisation Strategy, chiefly the need to support sustainable food systems, bioresource valorisation, and the green transition. But while policy ambitions are clear, the regional reality, especially for small rural producers, is more complex. Small and medium sized enterprises (SMEs) like Piesta Kuusikaru Farm produce valuable side streams such as apple pomace but lack the scale and technical resources to turn them into new products or income streams. Their situation reflects a broader regional pattern: small rural companies are too small to act alone, even when they sit on untapped circular economy opportunities. The BioBoosters Hackathon format offered a strategic tool to close this gap.

High-profile Cleantech Innovation Fostered in Vilnius

The Concept of Lithuanian Smart Specializations for 2021-2027 was approved on the 17th of August 2022 and aims to strengthen research and innovation capacities, create new technologies and simultaneously increase the country’s competitiveness and positions in global markets (Ministry of the Economy and Innovation of the Republic of Lithuania). In order to focus resources on areas with the greatest growth potential and potential competitive advantages of the national economy, the Smart Specialisation Concept has established 3 main priority areas:

- New production processes, materials and technologies,
- Health technologies and biotechnology,
- Information and communication technologies.

Cleantech and circular economy solutions intersect with all priority areas of smart specialisation. The priorities support Cleantech and the bioeconomy by advancing sustainable materials, energy-efficient processes, safe food, and digital solutions that drive circularity. The area on new processes, materials, and technologies includes the development of materials that are durable, recyclable, and environmentally friendly, supporting the circular economy by reducing waste and promoting reuse. It also encompasses the implementation of energy-efficient processes and renewable energy, aligning with circular economy goals. Health technologies and biotechnologies prioritize safe food and sustainable agriculture, emphasizing waste reduction, resource optimization, and better input monitoring to enhance the efficiency of biological resources. ICT contributes to the circular bioeconomy through AI and big data for resource optimization, predictive maintenance, and supply chain efficiency, while IoT enables real-time monitoring of resource flows and product life cycles, facilitating informed decisions for reuse and recycling.

All three thematic areas of circular bioeconomy transition tackled in the BioBoosters hackathons shall be classified as relevant and recognized development areas aligned with smart specialisation priority areas in Lithuania. The strategy supports developing bio-based materials and high-value products from biological raw materials, integrating digital technologies, and promoting innovation to enhance sustainability and resource efficiency in the bioeconomy.

Both of the BioBoosters hackathons organized by Sunrise Tech Park, demonstrate the strong alignment of the challenge topics and proposed solutions with the smart specialisation priorities, particularly in developing new production processes and technologies and importance of integrating digital technologies to promote sustainability and resource efficiency Firstly, the winning solution of the **Nando Hackathon** addresses overfertilization by using real-time data and precision drone application to optimize fertilization, employing digital technologies to enhance sustainability, improve resource efficiency and reduce environmental impact (Stanionytė & Popiera, 2024). **The Toksika Hackathon** held in spring 2025 focused on biological treatment of petroleum-contaminated soils, highlighting advanced in-situ biobased remediation technologies. The winning solutions, which combined remediation technologies with advanced biological products to accelerate cleanup, align

closely with smart specialisation priorities on advanced technologies and resource efficiency. (Stanionytė, 2025).

Transitioning from Health & Biotechnology to a Broader Bioeconomy Profile in Mecklenburg-Vorpommern

Circular economy and bioeconomy are very well represented in the Regional Innovation Strategy for Mecklenburg-Vorpommern 2021–2027 with following smart specialisation areas (Region Mecklenburg-Vorpommern). First, the strategy prioritises bioeconomy as a cross-cutting paradigm, aiming to promote the sustainable use of biological resources and systems in various sectors, such as:

- Agriculture and food systems, with emphasis on innovation in sustainable farming methods, precision agriculture, and circular food chains.
- Forestry, with emphasis on enhancing sustainable forest management and the development of bio-based products from wood and other biomass.
- Bioenergy, with emphasis on advancing technologies in the use of organic waste and renewable resources in order to generate energy in a climate-neutral way.

Secondly, the strategy emphasises 'Circular Economy Integration', with focus areas including: resource efficiency in production; recycling and reusability of biological and industrial materials; and supporting of closed-loop systems in agricultural and industrial processes. Finally, the strategy prioritises 'Ecological Modernization', with the support for climate protection through renewable biological materials; transformation towards a low-carbon and sustainable economy; and innovation partnerships between businesses and research institutions with the aim of delivering bio-based solutions.

The two BioBoosters hackathons organized by WITENO GmbH, i.e., are substantively strongly aligned with the smart specialisation strategy of Mecklenburg – Vorpommern ("strategic priority area with strong emphasis"). Firstly, the Cosun Beet Hackathon, with the challenge of transforming sugar beet residues from waste to value. In the hackathon multiple solutions were discovered to support the journey of Cosun Beet Anklam factory towards a biorefinery of the future (Mernitz, Kiel, Stukenbrock, & Aalto, 2024). Secondly, the AdFiS Hackathon, with the challenge of making the manufacturing

process of activated carbon more energy and material efficient, supported the sustainable development of European activated carbon production with promising approach to better energy and material efficiency (Mernitz, 2025).

Boosting Circularity in Smart Specialisation Areas of Świętokrzyskie

Świętokrzyskie Region from Poland, represented in the BioBoosters by PRO CIVIS Foundation for Education and Social Dialogue, has a sectoral focus in their smart specialisation strategy that is not directly addressing overarching areas such as bioeconomy or circular economy. The main document defining and describing the smart specialisations is the "Regional Innovation Strategy for Świętokrzyskie Region 2030 +", where the most notable sectoral smart specialisation areas connected to bioeconomy are 'modern agriculture and the agri-food sector' and 'sustainable energy development'. (Świętokrzyskie Voivodeship.)

With regards to modern agriculture and the agri-food sector development, the Świętokrzyskie region has favourable conditions for the development of organic farming (including herbalism) and opportunities for the development of agri-food processing, based on regional products. In order to use this potential and respond to global trends aimed at the production of high quality, healthy, ecological and safe food, it is necessary to take action aiming at optimising the processes of production, processing and storage of agri-food products. Within the specialisation, a significant role will be played by the acquisition and processing of bioactive compounds and other raw materials from plant and animal material, originating from the agri-food sector, but for further use in various industries. Another of the important areas of this smart specialisation is the foreseen increase of the use of renewable energy sources. High on the agenda is the development and implementation of waste energy management technologies and biogas energy. Apart from the benefits related to environmental protection, such activities may constitute an opportunity for the conscious development of energy agriculture.

The two BioBoosters hackathons organized by PRO CIVIS Foundation, i.e. **Targi Kielce Hackathon** and **Refal Hackathon** were classified as dealing with *"strategic priority area with strong emphasis"* in relation to the smart specializations of the Świętokrzyskie region. In the case of the Refal Hackathon the relation is straightforward, as the challenge (proposing innovative product and/or technological solution that will allow increasing the value of sound biomass from apples damaged by weather conditions) refers in its origins

to the ”modern agriculture and agri-food sector” smart specialisation. (Kuznowicz, 2025.)

With the Targi Kielce Hackathon, related to the circular solutions replacing single-use carpets of the trade fair centre, the connection to the smart specialisation strategy comes from one of the horizontal smart areas, i.e. ”trade fairs and congresses”. Within the scope of the ongoing analysis, it must be noted that the global agenda in the ”trade fairs and congresses” industry is to make the events greener, circular and sustainable and Targi Kielce Hackathon followed on this trend. (Kuznowicz, Gajek, Sobolewski, & Aalto, 2024).

Tapping into the Potential of Macro-regional Co-operation

Regional and macroregional strategies highlight the strong bioeconomy potential of rural areas in the Baltic Sea region, thanks to their rich natural resources (European Commission 2021). Yet, these regions face persistent challenges in expanding bioeconomy sectors, creating employment, and accessing global markets, largely due to limited human capital, weak business networks, and insufficient innovation capacity. Strengthening inter-regional cooperation is essential to bridge gaps in expertise, talent, and resources across the Baltic Sea area. To boost innovation in bioeconomy-focused rural regions, it is crucial to establish inter-regional smart specialisation (S3) platforms and processes that enable business-driven RDI collaboration and support the digital and green transformation of bioeconomy sectors (Honkanen et al., 2020).

The predominantly rural BioBoosters regions are recognizing the development and innovation opportunities offered by the circular bioeconomy paradigm and its components, such as valorisation of biological side-streams, biorefineries, efficient use of bioresources, new biobased ingredients, materials and products. They recognize also the importance of the application of smart technologies and digitalization – for the adequate and successful implementation of circular bioeconomy. In most of the analysed cases – the regional smart specialisations are naming concrete areas and elements of circular bioeconomy, which are of particular importance for the given region. Seven regions are explicitly naming the circular economy / bioeconomy / circular bioeconomy as their regional smart specialisations, with two regions referring to the substantive areas of key importance for circular bioeconomy.

A study conducted within the ’BSR S3 Ecosystem’ project highlights the increasing importance of strategic inter-regional smart specialization

(S3) cooperation as means to enhance regional competitiveness through innovation. The research underscores how policy learning experiments across the Baltic Sea Region have revealed new pathways for unlocking the potential of the bio- and circular economy through collaborative innovation efforts. Rural areas stand to benefit by expanding their Entrepreneurial Discovery Processes (EDP) and strengthening underdeveloped innovation ecosystems through more structured cooperation (Leino, 2020, 4–5). According to Perianez-Forte and Wilson (2021, 4, 21), effective stakeholder collaboration within EDP hinges on four key elements: sustained engagement, well-designed mechanisms for exploring niche expertise, transparent and fair organisational structures, and sufficient capacity to involve diverse actors, including the private sector. Based on the overall results outlined in this publication, it could be suggested that the BioBoosters hackathon model has potential to provide these rare conditions for inter-regional EDP. Specific study on this potential would be needed for final conclusions on this matter.

Recognised Relevance and Impact on Implementation of Regional Strategies

BioBoosters hackathons have contributed to the better recognition, visibility and implementation of circular bioeconomy principles in the connected regions. In most of the cases the hackathons' challenges were dealing with regional strategic priority area with strong emphasis (16 hackathons), with two hackathons acting within relevant and recognized regional development area. There were no hackathons dealing with topics that would not explicitly be included in the strategy. Out of the three main challenge themes – "the sustainable and resource-efficient use of bioresources via application of smart technologies and digitalization" and "valorisation of biological side-streams and development towards multi-output production chains (biorefineries)" have been given higher priorities, with the third ("discovery of biobased ingredients, materials and products") featuring less often in the strategical and operational considerations.

The selection of the challenges for the BioBoosters hackathons was delivered with the recognition of the actual strategic priorities of the BioBoosters regional hubs. This contributed to the positive outcomes of individual hackathons, as the substantive and organizational processes could have been properly structured and supported by the organisers – the BioBoosters regional hubs. There is also of course the dimension of the impact of the hackathons on the innovation in the given regions. This must be assessed

positive, as the BioBoosters hackathons strengthened the supportive potential of regional innovation hubs, by presenting to them an open innovation tool model, which at the same time boosts the circular transition and offers growth opportunities to the regional businesses. The hackathons enabled to build partnerships to solve arising challenges in a flexible manner and by utilizing the needed functionalities of existing regional innovation ecosystems.

The final conclusion refers to unequivocal positive contribution of the hackathons to the position of BioBoosters' regions inter-regional co-operation capacity. In all the nine regional cases the hackathons created a practical, challenge-driven platform for cross-border innovation and knowledge exchange. They have facilitated partnerships between local stakeholders and international actors and allowed for the transnational and interregional exchange of know-how and innovative insights. As a result, the BioBoosters regions have been stronger and more firmly embedded in European and Baltic Sea Region innovation ecosystems, particularly in the fields of bioeconomy and circular economy.

As have been shown, the BioBoosters hackathons dealt both with innovating and developing sustainable products, as well as reinforcing circular bioeconomy approaches in the sectors of agriculture and forestry. Evidently, they supported also learning from each other, including across the borders. All this means a vital contribution of the BioBoosters hackathons to delivering the objectives of the European Union and Baltic Sea Region strategy documents relating to circular economy transition and sustainable bioeconomy development in the regions.

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Boosting Circular Transition in Bioeconomy Sectors

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BioBoosters has targeted challenges of circular transition working with 18 companies of bioeconomy sectors to speed the uptake of circular business models. What has been the thematic and sectoral focus of the challenges? What can the challenges tell us about the industry needs for circular transition?

This article explores the challenges tackled with BioBoosters hackathons in the framework of circular bioeconomy transition and sustainable bioeconomy development to verify to what extent that BioBoosters hackathons have responded to the macro-regional and EU strategies on circular bioeconomy transition. The main sources for this analysis will be the hackathon invitations worked out jointly by the organisers and the challenge providers with the process aim to define the challenge and the criteria for the innovative solutions.

Circular Bioeconomy – Strategy for Sustainable Growth

The EU is actively promoting a circular bioeconomy as a key strategy for sustainable growth and environmental protection. The EU's bioeconomy strategy (European Commission [EC], 2018) aims to create a more sustainable, circular, and climate-neutral economy while fostering innovation and creating green jobs. Circular and sustainable production and consumption of biological resources for materials and services can increase efficiency and reduce pressure on resources. The strategy strives to ensure the long-term competitiveness of the EU bioeconomy and investment security as well as increasing resource-efficient and circular use of biological resources.

As for the EU's Circular Economy Action Plan, adopted in 2020, which is a key component of the European Green Deal – this document aims to accelerate the transition towards a climate-neutral, resource-efficient, and competitive economy by transforming how products are designed, produced, and consumed. The plan focuses on making sustainable products the norm, reducing waste, and promoting circularity across various sectors and value chains. (EC, 2020.)

Zooming into the Baltic Sea Region, the EU Strategy for the Baltic Sea Region dedicates one of its Policy Areas solely to ”Bioeconomy” and defines three main actions needed to deliver on bioeconomy, which in combination with the principles of circular economy, represent an opportunity for productivity, economic benefits and environmental improvement of the Baltic Sea Region countries. Simultaneuously, the importance of circular economy is also endorsed in other Policy Areas of the EU Strategy for the Baltic Sea Region. Policy Area ”Nutri” aims to propose measures to strengthen and promote safe and sustainable use of nutrients in a circular economy. Also, the Policy Area ”Innovation”, which is very relevant to the BioBoosters concept, specifies circular economy and bio-economy as key areas of transnational value chains of significant importance for: challenge-driven innovation (action 1); and cross-regional value chains with the potential to enable digital innovation and transformation (action 2). (EC, 2021.)

Circular Economy Paradigm and Practical Applications

To outline the thematic framework of the BioBoosters activities, including the challenges, the network presented a visualised paradigm for circular bioeconomy transition (figure 1). First introduced in the ’BioBoosters Impact Review 2024’, the BioBoosters diagram of circular bioeconomy transition highlights core principles of circular economy (Aalto, 2024):

- Eliminating waste and pollution.
- Circulating products and materials.
- Regenerating nature.

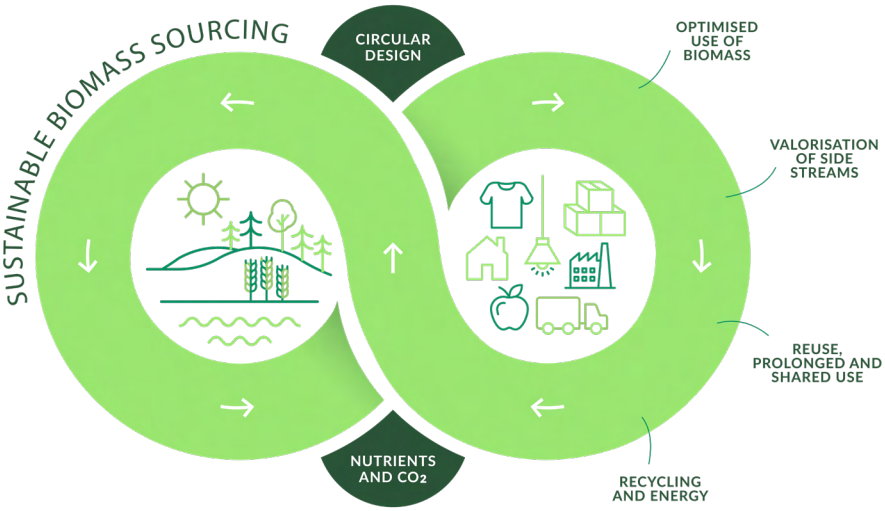

Figure 1. Circular Bioeconomy Transition (Aalto, 2024).

The visual emphasizes the circular transition needs of the Baltic Sea Region's bioeconomy sectors, advocating for sustainable production and use of biological resources. The left side represents sustainable biomass sourcing, emphasizing data-based management and nutrient recycling. The right side focuses on material and energy flows in biobased industries and society, promoting circular design and durability. Central to circular bioeconomy are1) optimizing biomass value over time, 2) using it for high-value applications and 3) maximizing side streams and residues for economic, social, and environmental sustainability. A complete circular bioeconomy realises also assumptions of a bio-based circular carbon economy, closing the carbon cycle and enhancing carbon sinks through sustainable practices. This approach mitigates climate change while producing valuable products and fuels.

For the purpose of the ongoing analysis, it is of vital to note the constituting elements of the circular bioeconomy paradigm that are inherent in the visualisation (Stegmann et al., 2020):

- Sustainable biomass sourcing.
- Cascading use of biomass.
- Use of waste and residues as a resource.
- Integrated multioutput production chains (e.g. biorefineries).
- Maintaining the value of the products, materials and resources for as long as possible.

- Energy recovery.
- Nutrient and carbon recycling.
- Circular and durable product design.

Challenge Providers across the Bioeconomy Value Chains

In the piloting, BioBoosters network was invitingchallenge provider companies that would have business operations in the bioeconomy value chains understood as:

- Production and processing (activities related to turning raw materials and components into a finished product, material, ingredients, energy, and / or service).
- Outbound and inbound logistics.
- Marketing and sales.
- Services.

During the piloting, BioBoosters network worked with a total of 15 challenge providers that operatedin production or processing of biomass. These challenge providers can be divided to agri-food business and forest-based bioeconomy.

Business operations in the agri-food system:

- Milk turned into dairy products by Valio Ltd (Jamk University of Applied Sciences, 2023).
- Legume protein, starch and potato turned into food and forage solutions by Aloja Starkelsen (Vidzeme Planning Region, 2023).
- Hemp turned into hemp-based food products by Nordic Hemp Cooperation (Estonian University of Life Sciences, 2025).
- Sugar beets turned into white sugar, bioethanol, and biomethane by Cosun Beet (WITENO GmhB, 2024).
- Horticulture, tomatoe production by Võiste Greenhouse (Pärnu County Development Centre, 2024).
- Apples utilized for the production of apple juices, shrub syrups, cider vinegars and apple stroops by Piesta (Pärnu County Development Centre, 2025).
- Fruit production – apples by REFAL (PRO CIVIS Foundation, 2025).
- Microbial-based bio stimulants as manufactured high added-value microbiological product for agriculture by Nando (Sunrise Tech Park, 2024).

Business operations in theforest-based bioeconomy:

- Wood turned into wood-based building and interior products by Moelven (Paper Province, 2023).
- Wood turned into different kinds of renewable products from the forests by Holmen (BioFuel Region, 2023).
- Wood by-products from sawmills and pulp industry, partly available as wood pellets, turned into energy and energy related products and services by Skellefteå Kraft and Karlstads Energi (BioFuel Region, 2024; Paper Province, 2024).
- Wood and wood by-products turned into packaging, biomaterials and wooden construction by Stora Enso (Vidzeme Planning Region, 2024).
- Wood-based charcoal processed into activated carbon by AdFiS (WITENO GmhB, 2025).
- Wood biomass (lignin, cellulose) turned into feed & food sector products by Fibenol (Estonian University of Life Sciences, 2024).

Some cases demonstrate also the cross-over potential between different bioeconomy sectors, value chainsand challenges. First, Fibenol is processing wood biomass to ingredients and materials for different industries, including the food industry. Second, AdFiS is using a binder derived from sugar beet processing in the activate carbon production. Finally, while the main energy source of the Karlstads Energi's CHP plant is forest industry side streams, they also operate as municipal waste management company. The challenge they presented was about discovering material recycling opportunities for natural cork (from wine bottles) to replace the current energy use.

Apart from the production and processing companies, BioBoosters hackathons covered companies working in the logistics – Kuljetus Tero Liukas Ltd (Jamk University of Applied Sciences, 2024) –, marketing and sales – Targi Kielce (PRO CIVIS Foundation, 2024) –, and hazardous waste management and soil remediation– Toksika (Sunrise Tech Park, 2025) and Karlstads Energi (Paper Province, 2025).

Unlocking the Valorisation Potential with Hackathons

There were several hackathons with challenges targeting to unlock the valorisation potential of biobased side-streams. As concluded by Stanionyte & Aalto (2025), to stimulate circular use of side streams in symbiosis model,

it is important to support decentralised networks of diverse actors such as businesses, municipalities, universities, and cluster organisation in order to lead initiatives based on their unique strengths and capacities. Here, the BioBoosters hackathon can play a significant role as showcased in the following examples.

Holmen Hackathon organized by BioFuelRegion (Sweden) with the challenge of finding sustainable and innovative uses for wood ash, which is a by-product from the biofuel boilers created during the heating and drying of wood. Annual wood ash production of Holmen factories is approximately 450 tons. There is of course undeniable value in returning some of it to the forests and land. But in the case of Holmen Hackathon a solution for transforming the wood ash from waste into a valuable resource has been sought. (BioFuel Region, 2023.)

Võiste Hackathon organized by Pärnu County Development Centre (Estonia) with the challenge of delivering new technologies and innovative solutions for the valorisation of biomass being the result of tomato production – roots, stems, leaves and non-standard tomatoes (5–7 tons per month). The company welcomed both on-site and off-site solutions, with a focus on sustainable practices and local, renewable sources. The hackathon's goal was not only to contribute through the end product, but also to valorise residual flows and close material cycles in collaboration with other sectors. (Pärnu County Development Centre, 2024.)

Piesta Hackathon organized by Pärnu County Development Centre (Estonia) with the challenge of developing sustainable, scalable, and financially viable solutions for the valorisation of apple processing by-products at the end of the value chain. Currently, apple pomace is composted but rising transportation costs and the untapped potential of the material present an opportunity for innovation. Participants in the hackathon were invited to develop solutions to transform apple residues into food, feed, cosmetics or biomaterials. (Pärnu County Development Centre, 2025.)

From Cascading use of Biomass to the Next Generation Biorefinery

Cascading use of biomass being one of the pillars of the circular bioeconomy paradigm and characterized as a strategy to maximize the value of a biomass resource by using it in a series of applications, from highest to lowest value – has been well represented among the BioBoosters hackathons' challenges. The concept of integrated multioutput production chains, such as biorefineries,

constituted of systems converting biomass into a variety of products like biofuels, chemicals, and energy, in order to maximize resource efficiency and economic value – also found its way into the BioBoosters proceedings.

Fibenol Hackathon organized by Estonian University of Life Sciences with the challenge of finding new high value applications for valorising cellulosic sugars, lignin and specialty cellulose for food or feed production. Fibenol annual production capacity is 6,500 tons of lignin, 20,000 ton of cellulosic sugars and specialty cellulose at ton scale. The main idea of the hackathon was to harness the power of lignocellulosic (lignin has natural antioxidant behaviour, cellulosic sugars are highly fermentable making it perfect feedstock for ethanol or alternative protein production) and open the doors to a sustainable biotech era. (Estonian University of Life Sciences, 2024.)

Nordic Hemp Hackathon organized by Estonian University of Life Sciences with the challenge of proposing novel uses for such hemp by-products as hemp fibres, dust, and hurd, which are obtained during the decortication of hemp stalks at the company. The challenge was about going beyond the conventional solutions like using hemp hurd for hempcrete, dust for briquettes, or fibres for clothing and to come up with innovative approaches that push the boundaries of current applications and maximize the valorisation of hemp fibres, dust, and hurd, for example by employing these in the health and wellness products and services. (Estonian University of Life Sciences, 2025.)

REFAL Hackathon organized by PRO CIVIS Foundation for Education and Social Dialogue (Poland) with the challenge of proposing innovative product and/or technological solution that will allow to increase the value of sound biomass from apples damaged by weather conditions. The apples are a full value product, but due to various types of skin or shape defects, such fruits are disqualified from direct sales. The result is a significant loss of value of such fruits, which are then sent – at unit prices, as for the so-called drops – to plants producing juices or concentrates. The dynamic development of the bioeconomy and constantly emerging market of organic origin substances, chemical molecules, materials, semi-finished products and consumer products offer new and extended possibilities to better valorise the apple biomass. (PRO CIVIS Foundation, 2025.)

Cosun Beet Hackathon organized by WITENO GmbH (Germany) with the challenge of transforming sugar beet residues from waste to value. Approximately 2 million tons of sugar beets are processed by the Cosun Beet company's Anklam site from September to January, with intermediate products stored, and bioethanol and biomethane produced throughout the year. But the mission – to be realized also through the BioBoosters hackathon

– has been to 1) transform the factory into a green biorefinery, offering a diverse product portfolio for different markets 2) use the full potential of plant in a circular way, meaning making the sugar beet a 100 per cent circular resource that does not produce waste. (WITENO GmhB, 2024.)

Discovering Biobased Products, and Ingredients

Biobased products, derived from renewable biological resources like plants and trees, are a key component of sustainability because they can replace fossil-based materials, reduce greenhouse gas emissions, and support a circular economy. The potential innovative solutions in the areas of biobased products (incl. packaging) and ingredients were sought after in three BioBoosters hackathons.

Moelven Hackathon organized by Paper Province Economic Association (Sweden) with the challenge of finding alternative solutions to replace the fossil – based plastic packaging of wooden panels for indoor use. The current packages are made of fossil-based plastic and are up to 5.4 meters long and 24.5 centimetres wide. Each year, one million sets of wooden panels are sold, incl. the plastic packages. Though the plastic packages fulfil the functional needs, but do not live up to Moelven's demands for sustainability. Therefore, a more sustainable solution meeting the requirements for protection, moisture regulation and visual presentation has been searched for.

AdFiS Hackathon organized by WITENO GmhB (Germany) with the challenge of making the manufacturing process of activated carbon more productive by re-pelletizing product undersize particles with a suitable binder, ideally of biological origin. Many actual binders either adhere to the existing inner surface of the activated carbon, reducing its adsorption capacity, or they result in insufficient pellet hardness. Therefore, the company started looking for an alternative bio-based material contributing to more efficient activation process. (WITENO GmhB, 2025.)

Targi Kielce Hackathon organized by PRO CIVIS Foundation for Education and Social Dialogue (Poland) with the challenge of proposing bio-circular product innovation with functional and aesthetic potential to replace polypropylene carpets commonly used in the exhibition industry. The innovation was supposed to meet the bio-product criteria (made from organic materials available on a renewable basis) and to implement the principles of circular bioeconomy (biodegradation or the possibility of processing as a waste bioproduct). (PRO CIVIS Foundation, 2024.)

Boosting Sustainable Biomass Sourcing and Processing with Digitalisation and Smart Technologies

As digitalization and smart technologies enhance more and more biomass sourcing by using tools like AI, GIS, and sensors in order to ensure data-driven decision making, optimize supply chains and improve logistics – this subject scope found its way also into the innovative realm of BioBoosters.

Valio Hackathon organized by Jamk University of Applied Sciences (Finland) with the challenge of identifying practical methods to mitigate seasonal variations in milk production throughout the year. The challenge involved addressing the issue from the grassroots level and focused on effective and profitable solutions at the farm level that will ultimately impact the entire production chain. Steady milk production would not only enable better cost management and production planning across the entire supply chain but also help maintain the capacity of Valio's production facilities and milk collection at a consistent level. For dairy farms, steady production would also offer economic advantages. (Jamk University of Applied Sciences, 2023.)

Liukas Hackathon organized by Jamk University of Applied Sciences (Finland) with the challenge of providing a smart logistics management solution for the growing material flows of biogas and recycled fertilizer value chains. The company was looking for digital tool supporting the management, reporting, and invoicing of slurry and digestates transported between the biogas plants and farms. Accurate nutrient information directly from the transport equipment shall serve adding value to biogas plants and farms – Kuljetus Tero Liukas Oy's customers. (Jamk University of Applied Sciences, 2024.)

Skellefteå Kraft Hackathon organized by BioFuel Region (Sweden) with the challenge of improving the methods to get accurate, quality assured and up-to-date physical and geometric data on the biomass piles into digital format, as well as getting alerts about important or dangerous changes in and around the biomass piles. For the purpose of providing district heating – Skellefteå Kraft uses the raw material, i.e. forest-based residues, which are delivered continuously during the year and stored separately in piles. The company wanted to ensure better quality and traceability of data in order to get better follow-up and control of energy statistics and inventory. (BioFuel Region, 2024.)

Aloja Starkelsen Hackathon organized by Vidzeme Planning Region (Latvia) with the challenge of ideating ways for improving production process through a planned CMMS Computerised Maintenance Management System (CMMS) and a logical strategy for equipment servicing and spare parts

warehouse maintenance, while creating a streamlined and easy-to-operate program. The aim of the effort was to create a working, easy-to-use system and save natural, material and human resources, making the product more competitive and greener. (Vidzeme Planning Region, 2023.)

Stora Enso Hackathon organized by Vidzeme Planning Region (Latvia) with the challenge of delivering innovative, eco-friendly solutions to combat the dual threats of blue stain in sawn logs and wood-damaging insects without increasing water consumption. As freshwater plays a central role in Stora Enso production processes and is a key component in forest growth, both water availability and water management are of key importance to the company, which is committed to transforming the forestry sector for a more sustainable future. (Vidzeme Planning Region, 2024.)

Nando Hackathon organized by Sunrise Tech Park (Lithuania) challenged participants to develop innovative solutions to tackle overfertilization, which poses a significant threat to both environmental and agricultural sustainability and leads to interconnected problems like water pollution, soil degradation and loss of biodiversity. Nando sought efficient and cost-effective methods for precise, environmentally friendly fertilizer management, including smart agricultural platforms, precision fertilization technologies, biostimulant integration, and eco-friendly fertilizer alternatives (Sunrise Tech Park, 2024.)

Moving up the Waste Hierarchy

Recycling is one of the components of the circular economy, as it aims to create closed-loop systems where waste materials are recycled and converted into valuable new products, creating a more sustainable and resource-efficient practices. The bioremediation on the other hand constitues an example of bioeconomy activity, by cleaning up pollution using biological organisms. This is how the two concepts (recycling and bioremediation) were substantively taken up by the BioBoosters hackathons.

Karlstads Energi Hackathon organized by Paper Province Economic Association (Sweden) with the challenge of finding a sustainable and scalable solution for recycling natural cork. The main goal was to reduce waste by recycling natural cork, instead of it going directly to energy recovery through incineration. As of today the corks are used only once before being discarded. The sought-after solution should have been scalable, implementable on an industrial level, and spread nationally. The winner was allowed free access to a biobased raw material that has not previously been recycled. (Paper Province, 2025.)

Targi Kielce Hackathon (double-track) organized by PRO CIVIS Foundation for Education and Social Dialogue (Poland) with the challenge of delivering recycling technologies of polypropylene floor coverings used so far by Targi Kielce, along with a presentation of the possibilities of using the recycling's results by the company or other entities in the existing or new value chain. Targi Kielce as one of the leading trade fair organizers in Eastern and Central Europe decided to take up actions limiting the environmental burdens caused by the actual floor coverings, being not – ecological and of very short and irretrievable life cycle at the company. (PRO CIVIS Foundation, 2024.)

Toksika Hackathon organized by Sunrise Tech Park (Lithuania) with the challenge of exploring groundbreaking solutions for the biological treatment of petroleum-contaminated soil. Contamination with petroleum products poses a significant environmental threat, disrupting ecosystems and slowing natural recovery efforts. Biological soil treatment, which uses microorganisms to break down contaminants, has emerged as a promising solution. The company expected to find effective and scalable methods to enhance bioremediation without harming the microbial communities driving the cleanup. (Sunrise Tech Park, 2025.)

Substantive Range of Challenges Representing the Realities of the Circular Economy Transition

As a conclusion it must be stated that the substantive range of the challenges put forward in 18 BioBoosters hackathons was far reaching and was covering most of the key and current topics of the global, European and Baltic Sea Region circular bioeconomy agenda, i.e. making sustainable products, ensuring less waste and reinforcing sustainability of agriculture and forestry. It needs to be emphasized that the BioBoosters hackathons encompass in a very well manner the different constituting areas of the circular bioeconomy concept.

Furthermore, the BioBoosters hackathons deliver strongly on the innovative solutions and respond adequately to the circular bioeconomy challenges. The products, services, methods and models proposed as innovative solutions to the posed circular bioeconomy challenges – are responding in a novel and market – oriented ways. They introduce new concepts or creatively use existing concepts and available technologies contributing to the better understanding and wider dissemination of the circular bioeconomy paradigm.

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Theme 3

Delivering the Value Propositions

Guided, Turnkey, Process for the Challenge Provider

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The article explores the main benefits for the challenge provider of the BioBoosters hackathon based on the feedback surveys conducted at the end of the Hackathon days for the 18 international hackathons organised in 2023–2025. From the survey results and key indicator collection, conclusions are drawn on whether the hackathon process has been effective in addressing the problems and development ambitions of challenge provider.

The BioBoosters Offer for Challenge Providers

BioBoosters Hackathon – Fast-track your circular economy transition with innovative solutions and new business and RDI partners!

From the start of the piloting, a value proposition was defined for the challenge providers to detail the expected benefits for this target group to be tested with the piloting and evaluation activities. Challenge provider of a BioBoosters hackathon is offered an effective and guided process to find solutions and to engage new partners to work with you on your challenge. As defined in the value proposition, the challenge provider will benefit from (Jamk University of Applied Sciences, n.d.):

- Scouting of solutions via extensive international business and research networks.
- Learning to look at your challenge in new ways with out-of-box ideas from cross-sectoral experts, SMEs, start-ups, and research teams.
- Support from experts in the further development of ideas and the commercial implementation of solutions.
- Tangible business benefits and sustainability impacts via established RDI and commercial partnerships.
- Positive visibility for your company's sustainability mission. Building brand image and employer image.

This offer is expected to support a challenge provider company from bioeconomy value chains in following tasks;

- Market research and mapping of potential solutions not yet on the market.
- Addressing the growing requirements and pressure for green transition from clients, investors, and consumers.
- Identification of tangible steps to implement climate/sustainability/ green transition strategies/ industrial symbiosis.
- Dialogue, comparison, and negotiation with potential RDI partners or commercial co-operation partners.

Participating in a hackathon offers a powerful solution for companies facing RDI challenges that fall outside their core expertise. It provides access to fresh perspectives and multidisciplinary talent, helping to overcome stagnation and uncertainty in development paths. Hackathons foster rapid ideation and problem-solving, enabling companies to explore new business opportunities and value chains without needing pre-existing networks or partnerships. For organizations with limited internal capacity or time, the structured and time-bound nature of a hackathon creates a focused process to address complex issues, especially those related to sustainability, while leveraging external innovation to accelerate progress.

The challenge providers involved in the piloting came, as to be expected, from the countries where organisers are based. Hence, they came from seven countries, with two challenge providers from Finland, Poland, Germany, Latvia and Lithuania and four challenge providers coming from Sweden and Estonia (as each of these countries is represented by two partners in the project). The companies represented the bioeconomy sectors or has operations in the bioeconomy value chains (Jamk University of Applied Sciences, n.d.). There was an equal division of large enterprises and small and medium sized enterprises (SMEs) represented as challenge providers. As shown in figure 1, the vast majority of the challenge providers were first timers to the hackathon process. From 48 respondents, 96 per cent reported to have no previous experience as challenge providers in a hackathon.

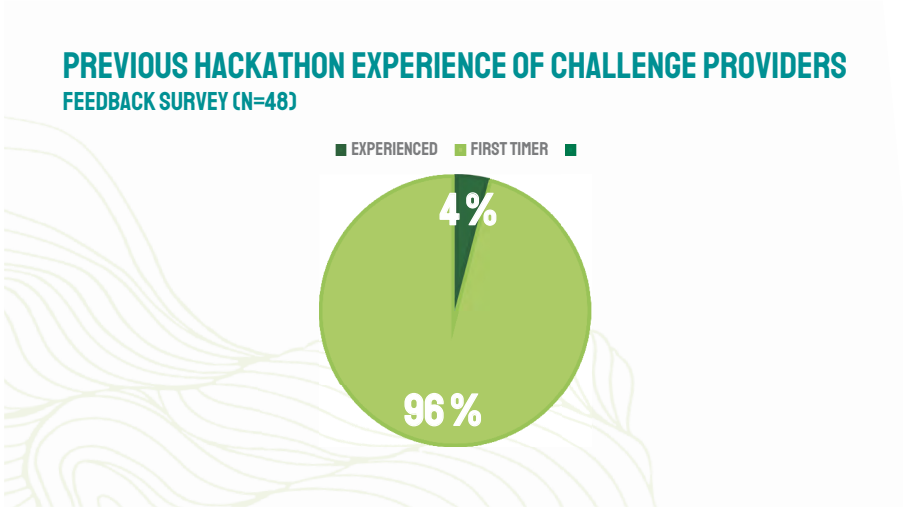

Figure 1. Previous hackathon experience of the challenge providers.

Challenge Providers Satisfaction was High

> *Receiving the invitation to join the hackathon was a fantastic opportunity to expand our knowledge and gain fresh ideas. Our goal was to explore sustainable solutions, and this event opened our eyes to perspectives we hadn't even considered before. We're now inspired to implement not just the winning teams' idea, but also some of the innovative concepts we discovered from other teams. The outcome was better than expected. – Uldis Deisons, Launkalne Mill Director, Stora Enso Wood Products (Deisons, 2025).*

Overall, the satisfaction of the challenge providers has been high. According to the feedback survey results, 98 per cent of the challenge providers (n=46) reported to have found a promising solution idea(s) for solving their challenge. Furthermore, the challenge providers reported positively on the value statements of the hackathon process. On the challenge providers' feedback survey administrated in the hackathons (n=43):

- 95% agreed that BioBoosters hackathon is a good tool for a large company to grow international research, development, and innovation networks.
- 98% agreed that BioBoosters hackathon is a good tool for a large company to grow national research, development, and innovation networks.

- 95% agreed that BioBoosters hackathon is a good tool for a large company to connect with cross-sectoral expertise.
- 98% agreed that BioBoosters hackathon is a good tool for a large company to connect with small-scale innovators.
- 93% agreed that BioBoosters hackathon is a good way to get out-of-box ideas and new perspectives on a challenge.
- 86% agree that BioBoosters hackathon process helps to overcome barriers to circular economy transition.
- 81% agree that is a good way to promote company's sustainability mission.
- 77% agree that BioBoosters hackathon process supports planning the innovation process from idea to application.

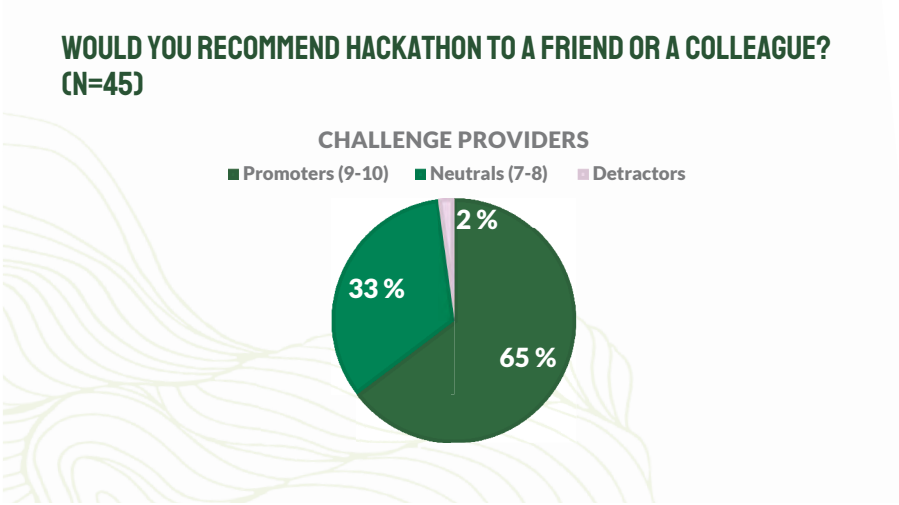

Figure 2. Net Promoter Scores of the challenge providers collected in the 18 BioBoosters hackathons

Satisfaction has been also measured with the net promoter score, shown in Picture 2. A total of 65 per cent of the respondents (n=45) can be considered strong promoters (responding 9-10 on a scale of 0-10 to the question: would you recommend BioBoosters hackathon to a friend or a colleague). The share of detractors (responding 0-6) is low at 2 per cent, while 33 per cent can be considered neutral – not strong promoters, but with a positive experience.

Diverse, Multidisciplinary Support as Important Value

> *The hackathon was excellent – well-organised, with a strong team, and it sparked a lot of new ideas. For Nordic Hemp, it was an eye-opening experience that encouraged us to think outside the box. We know hemp and its potential well, but the participants brought completely fresh perspectives. In Estonia, collaboration between companies and universities hasn't been our strong suit, but events like this create real opportunities.– Ardi Oja, CEO at Nordic Hemp Cooperation (Oja, 2025.)*

One of the most significant values emerging from the BioBoosters hackathon model is the access to diverse, multidisciplinary support, which has proven essential for companies facing complex, unfamiliar innovation challenges. With 91 per cent of challenge providers (n=46) affirming the impact of cross-sectoral know-how, hackathons have become a gateway to fresh perspectives and specialized expertise that companies often lack internally. This is especially critical when the innovation need lies outside the core business or when existing networks and competencies are insufficient to explore new development paths. Testimonials from Võiste Greenhouse, Stora Enso, and Refal highlight how the breadth and quality of solutions exceeded expectations, underscoring the transformative potential of engaging multiple disciplines in a single innovation process (Uusen & Knuuttila, 2024; Kucina, 2025; Kuznowicz, 2025).

The structured involvement of mentors, whose support was rated highly by 87 per cent of the challenge provider respondents, further amplifies this value, ensuring that knowledge transfer is not only present but increasingly well-organized. Moreover, the ability of hackathons to unite various departments and stakeholders around a shared challenge fosters internal collaboration and strategic alignment. While navigating diverse solutions can be complex, the long-term benefit lies in building a resilient innovation ecosystem were multidisciplinary input drives sustainable and competitive growth.

Obtaining Support for Research, Development and Innovation

> *I have to say first of all we were a bit sceptical about this process of the BioBoosters hackathon. But within the time we see the professionality and we loved it because we have a chance to get into contact with other research groups which are in similar fields as we are, but we didn't know before. I think we should work together with all of them – Dr. Toni Miersch*

Based on the feedback surveys, the lowest scoring value statement has been the claim that the hackathon process supports planning the innovation process from idea to application. This statement was supported by 77 per cent of the challenge provider respondents (n=43). Although not the most consistently experienced value, there were many hackathons that delivered positively in this regard – in fact, the range of responses between hackathons were from 0–100 per cent.

It is worth to note that some challenges have been more oriented towards building research collaboration while others have focused primarily on commercial solutions. A strong research focus was evident, for example, in the case of AdFiS Hackathon, that launched two research collaboration initiatives (Mernitz, 2025); and Cosun Beet Hackathon, that launched two collaborations with research groups and one research-oriented initiative with a startup company (Mernitz, Kiel, Stukenbrock, & Aalto, 2024).

Staff Training to Navigate Complex Challenges and Opportunities

> *One thing we have learned in our hackathons is that the process of challenge formulation within the challenge provider can act as a catalyst of organisational change via the gained deeper 'understanding' their own production or processes. When involving a large internal team connecting different units, the challenge provider is able to build capacity on the challenge and carry effective and targeted 'training' for their staff to handle the sustainability challenge in the company's operations.*
> *– Eva Fridman, BioFuel RegionBeyond generating innovative solutions*

BioBoosters Hackathons have proven to be valuable learning environments for the staff of participating companies. For many challenge providers, the process of preparing for and engaging in a hackathon becomes a form of informal training—helping their own team better understand the challenge, articulate them clearly, and explore new strategic directions. As described in the citation from Eva Fridman detailing the experiences of the Skellefteå Kraft hackathon, a hackathon can equal to staff training on the framework of an operational challenge and the potential solutions. The same conclusion was noted by the organizer of the Alojas Hackathon, defining a company's problem in a way that invites targeted solutions is often difficult and time-consuming outside of such structured formats (Kucina & Riekstiņa, 2024). The hackathon accelerated this process, enabling clearer communication and more efficient problem-solving. Moreover, the event offered staff exposure to

open innovation practices, mentoring, and multidisciplinary dialogue, which enriched their understanding of RDI processes. Stora Enso's representative described the hackathon as a "fantastic opportunity to expand our knowledge and gain fresh ideas," highlighting the educational value embedded in the experience (Kucina, 2025). Even when internal capacity is limited—whether due to time constraints or lack of expertise—the hackathon format provides a focused, collaborative setting where staff can learn by doing, observe diverse approaches, and build confidence in navigating future innovation challenges.

The learning as well as the multidisciplinary dialogue can be enhanced also by combining several challenges under a single overarching theme. This can be effective and create additional value for challenge providers, as demonstrated by examples like Cosun Beet and AdFiS, both hackathons organized by WITENO GmbH. At Cosun Beet, the challenges all revolved around the utilization of various side streams from sugar beet processing (Mernitz, Kiel, Stukenbrock, & Aalto, 2024). Similarly, AdFiS focused on sustainable activated carbon production, although with more diverse sub-challenges. In the case of AdFiS, the challenge was more complex because it involved two distinct goals: reducing the activation temperature and utilizing waste materials. Each required different technological approaches. Explaining these nuances to potential solution providers and finding the right experts demanded significantly more effort. Nevertheless, it made sense to treat these as one integrated case rather than splitting them into separate hackathons, as the overall objective was unified. (Mernitz, 2025.) Analysis of these cases and conclusions drawn indicate that such an approach creates a number of effects. First of all, they can receive solutions addressing multiple challenges simultaneously. Moreover, the involvement of multiple departments within the company fosters cross-functional collaboration. However, such complex hackathon process may also entail some disadvantages: individual challenges may remain unsolved, but also deciding on which solutions or partners to continue working with can be difficult due to the variety of approaches.

The Asset of Growing Networks Locally and Internationally

> *I think the biggest impact with Piesta Hackathon has been the opportunity to bring great minds together and forge new connections. While participants work to solve the challenge we've posed, they're also discovering future collaboration opportunities – both among the teams themselves and with the mentors. I'm confident that more people than just our company will benefit from this. – Külli Eller, Owner of Piesta Kuusikaru Farm.*

One of the most powerful outcomes of the BioBoosters Hackathon model is its ability to expand both national and international innovation networks. This network-building capacity has been actively demonstrated in practice. Võiste Greenhouse, for example, highlighted the immense value of gaining access to a wide-reaching international expert community (Uusen & Knuuttila, 2024). Similarly, Piesta Kuusikaru Farm benefited from the concentrated expertise of five international teams, bridging the gap between local challenges and global solutions. These events create rare opportunities for companies to engage with international talent, exchange knowledge, and build partnerships that would be difficult to establish independently. (Uusen, 2025.) As shown in both examples, the value of the networks and reaching expertise across borders can be significant especially to a rural small and medium sized enterprise that typically suffer from limitations of the local innovation ecosystem.

Conclusions on Value Delivery to Challenge Providers

> *This was the first hackathon with Toksika's participation as a challenge provider, and we were truly impressed by the teams' enthusiasm for innovation, their openness to new ideas and strong dedication to their work. It was an inspiring and dynamic event filled with creativity, good energy and expertise. We received a wide range of ideas, unique proposals, and advanced solutions, addressing the challenge. – Marius Busilas. Development Manager of UAB Toksika.*

The analysis of feedback from challenge providers confirms that BioBoosters Hackathons deliver substantial value, offering both anticipated and surprising benefits that help companies address complex challenges. Participants—ranging from large enterprises to SMEs—consistently express satisfaction with the hackathon model, with no notable differences in its perceived effectiveness across company sizes. The most impactful outcome is the generation of promising solutions, complemented by the high appreciation for out-of-the-box thinking and fresh perspectives. Mentorship and access to cross-sectoral expertise are also highly valued, particularly in the second piloting round, indicating growing maturity in knowledge transfer. Combining multiple challenges within a single event fosters internal collaboration and problem-solving, though it may introduce complexity in evaluating diverse solutions. Networking opportunities stand out as a key benefit, especially for smaller firms lacking established partnerships.

The hackathons also contribute meaningfully to sustainability and circular economy goals, while growing international participation enhances expertise

exchange. Although visibility impact is rated slightly lower, the events are widely recognized as valuable learning platforms that strengthen engagement with open innovation practices.

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Direct Client Dialogue and Mentoring Valued Solution Providers

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The article explores the main benefits for the solution providers of the BioBoosters hackathon based on the feedback surveys conducted at the end of the Hackathon days for the 18 international hackathons organised in 2023–2025. From the survey results and key indicator collection, conclusions are drawn on whether the hackathon process has been effective in creating growth opportunities for the solution providers and helping them in their innovation journeys.

The BioBoosters Offer for Solution Providers

BioBoosters Hackathon – Boost your solution to the markets with professional mentoring, client dialogue and RDI partnerships!

From the start of the piloting, a value proposition was defined for the solution providers to detail the expected benefits for this target group to be tested with the piloting and evaluation activities. Solution provider of a BioBoosters hackathon is offered an effective and guided process to develop the business potential of a solution proposal in dialogue with specialist mentors and a potential client. As defined in the value proposition canvas, the hackathon process will support the solution provider in addressing the following struggles of accessing the market with a new solution (Olesiak, Sobolewski & Aalto, 2023.):

- As a small business, we struggle to get into dialogue with large companies.
- We see a lot of potential in our solution but as a small business we hope to find partners to work with us to help pilot the solution and/or establish new value chains or build the needed ecosystem.
- We are not connected in this sector and do not properly understand client needs.

- We have a proof-of-concept but it is difficult to find first commercial piloting opportunities and first clients.
- We are not sure what is the best way forward; it is difficult to compare potential development paths.

This offer is expected to create the following gains for a solution provider with an innovative idea supporting circular transition of the bioeconomy sectors;

- Dialogue with a potential client; understanding client needs
- Knowing whether to invest resources into further development
- Network building and discovery of services and funding opportunities for idea testing
- High-profile promotion to the know-how and solution of the team
- Learning to speak the language of our client and how to sell our idea
- Planning an innovation process from idea to market

For solution providers, the BioBoosters hackathon offers a rich set of gain creators that significantly enhance their innovation journey. Participants benefit from free professional mentoring and direct dialogue with potential clients, allowing them to refine their ideas with targeted feedback. The process also opens doors to services and funding opportunities for testing and scaling their concepts. Visibility is actively supported through press releases, social media campaigns, and LinkedIn promotion, while impact stories are shared on the Hackathon platform to showcase success. Throughout the process, the entire experience is streamlined by a responsive contact person and a user-friendly online platform that centralizes all essential information. These elements together create a supportive and empowering environment for innovators to grow, connect, and succeed.

What kind of Solution Providers were attracted to the Hackathons?

Solution providers are attracted to the BioBoosters hackathons via an open call for solutions targeted to a specific challenge with a specific co-operation offer for the winning teams related to launching a commercial or research-based co-operation with the challenge provider. Potential solution providers apply to take part in the hackathon by submitting a brief description of their team capacity and the solution proposal for the evaluation of the challenge provider. In the BioBoosters piloting, 246 applications were received and 121

solution provider teams selected to take part in the hackathons from Kick-off to the Hackathon days operated under a non-disclosure agreement. Teams are able to determine their own membership, so one team can also represent multiple companies or research-industry co-operation.

As shown in figure 1, majority of the solution provider teams represented industry – large enterprises and small and medium enterprises (SMEs). About one third of the teams is research-oriented – research groups, students and innovators. In addition, there is a small share of other teams, including NGOs and co-operation teams connecting research and industry. As shown in figure 2, applications have been received from over 20 countries, while teams have participated from over 15 countries. Survey with the hackathon finalists indicates that 79 per cent of the solution provider team representatives were first timers as shown in Picture 3.

Figure 1. Professional backgrounds of the solution providers teams that applied and were selected to join the hackathons

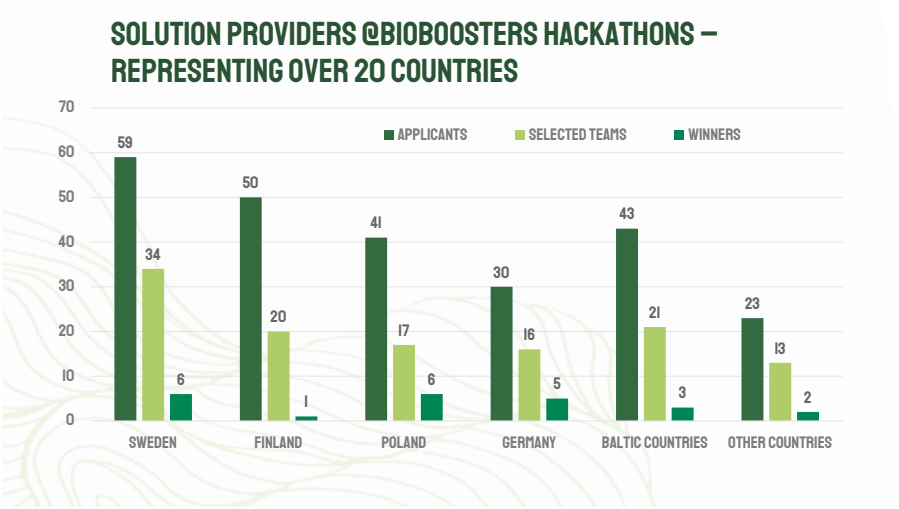

Figure 2. Country backgrounds of the solution provider teams: applicants, selected teams and winners

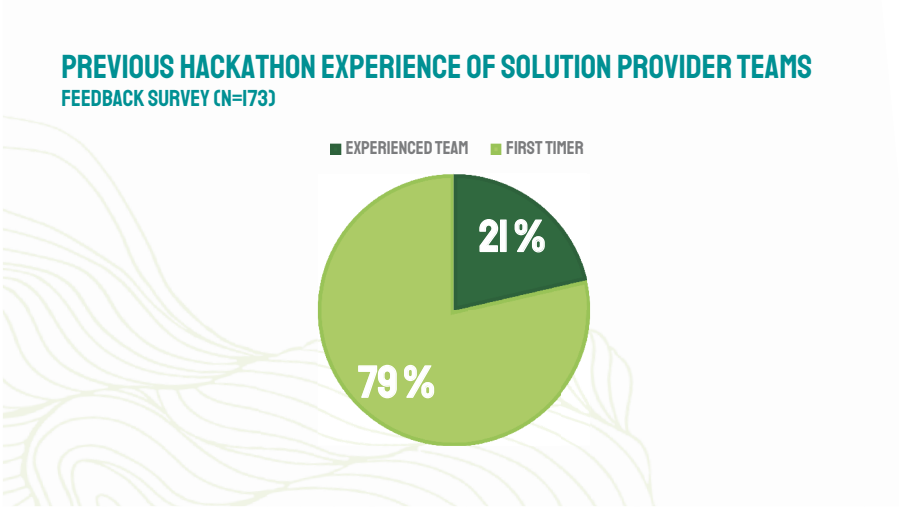

Figure 3. Previous hackathon experience of the solution provider teams

Essentially the team backgrounds reflect well the target groups of the hackathon challenges. The active scouting and communication campaigns have reached a lot of teams without previous experience in hackathons and thus the piloting has had a capacity building effect on the open innovation readiness of many companies and research groups working in the bioeconomy sectors.

Gains of the Solution Provider Suggest Horizontal Value Creation

Looking at the target groups of the BioBoosters hackathon, the satisfaction of the solution providers in terms of a Net Promoter Score, are the lowest, although positive. This might be expectable as not all teams come out as winners. A total of 57 per cent of the respondents can be considered strong promoters (responding 9-10 on a scale of 0-10 to the question: would you recommend BioBoosters hackathon to a friend or a colleague). The share of detractors (responding 0-6) is low at 6 per cent, while 37 per cent can be considered neutral – not strong promoters, but with a positive experience. It is also evident that their overall assessment of hackathons has improved during the latest piloting round (NPS has increased from 42 to 52). It needs to be highlighted that there was no negative score in the second piloting round, moreover, there have been two hackathons with scores of 100 (Nordic Hemp and Refal) which has not taken place in the first round.

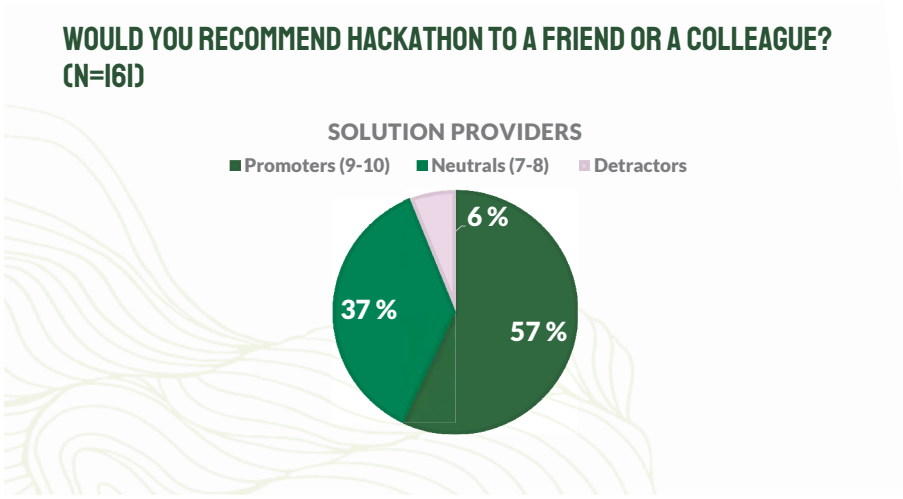

Figure 4. Net Promoter Score of Solution providers in the BioBoosters Hackathons (18)

The results show that positive value creation is reported from many teams beyond the winning teams; generally, it seems that the horizontal value creation stemming from the co-creation dialogue, mentoring, networking and visibility is working (and has improved in the course of the piloting) in the BioBoosters hackathon process. According to the feedback survey results, **95 per cent of the solution providers (n=164) reported to have gained know-how from the mentoring.** Furthermore, the solution providers reported positively on the value statements of the hackathon process. On the solution providers' feedback survey administrated in the hackathons (n=160):

- 95% agreed that BioBoosters hackathon is a good way to get visibility for your team's expertise.
- 94% agreed that BioBoosters hackathon is a good tool to build partnerships for idea testing and commercialisation.
- 93% agreed that BioBoosters hackathon is a good tool for validating a business idea or proof-of-concept.
- 91% agreed that BioBoosters hackathon is a good tool for entering into a dialogue with large companies.
- 88% agreed that BioBoosters hackathon is a good tool for finding new business opportunities and clients.
- 88% agree that BioBoosters hackathon is a good tool for getting detailed understanding on the needs of a potential client.
- 81% agree that is a good way to promote company's sustainability mission.
- 74% agree that BioBoosters hackathon process supports planning the innovation process from idea to application.

Mentoring Creating Considerable Value

> *Great experience. Especially meeting all the mentors that had very different points of input and different backgrounds has been very valuable. Interacting with all the participants and people with in-depth knowledge on the dairy farm operations was inspirational and gave a lot of insights to the challenge at hand. – Agnes Lindell and Niclas Lovsjö, Elvenite AB (Lindell & Lovsjö, 2023).*

Among the most valued aspects of the BioBoosters Hackathon experience for solution providers is the opportunity to gain expert know-how through mentoring. An impressive 95 per cent of respondents reported significant impact from the mentors' support confirming the importance of "professional

mentoring for free" as a core gain creator in the Value Proposition Canvas. Participants consistently praised the depth and diversity of insights received. Elvenite, winner of the Valio Hackathon, emphasized how engaging with multiple mentor groups enriched their understanding from various perspectives and helped refine their idea presentation (Iso-Ahola & Aalto, 2024). Similarly, Food4Future Technologies and Dar Ogrodu, winners of the Refal Hackathon, highlighted the mentor sessions as a pivotal learning experience, noting how open dialogue with experts guided their final pitch (Kuznowicz, 2025).

Beyond mentoring, 85 per cent of solution providers also recognized the hackathon's role in granting access to cross-sectoral expertise—a value statement ranked second in impact. The Billerud AB team, winners of the Moelven Hackathon, reinforced this by describing the event as a meaningful learning opportunity, further illustrating how hackathons foster both innovation and professional growth. (Hildén, Myhrén, & Persson, 2024.)

Co-creation Dialogue with the Potential Client

For solution providers, the BioBoosters Hackathon offers a rare and valuable opportunity to engage in direct dialogue with potential clients—often large industry leaders—and gain deep insight into their needs. This co-creation process is not only a gain creator identified in the Value Proposition Canvas but also a defining feature of the hackathon experience. Innovators benefit from real-time feedback, strategic guidance, and the chance to validate their ideas in close collaboration with end-users. The Aiseemo team, winners of the Liukas Hackathon, emphasized the value of daily discussions with Kuljetus Tero Liukas Oy, which helped them better understand customer requirements and refine their solution accordingly (Aalto, 2024). Survey results support this insight: 91 per cent of solution providers see the hackathon as a strong tool for initiating dialogue with large companies, and 88 per cent confirm its effectiveness in uncovering detailed client needs.

This dynamic exchange fosters mutual understanding and accelerates the innovation process. Teams like CAPitalize Leaves and Biocompost AB described how feedback from challenge providers helped them adjust and optimize their ideas, while SIA 7 Lines highlighted the benefit of working closely with Aloja Starkelsen to grasp business needs at a granular level (Mernitz, Kiel, Stukenbrock, & Aalto, 2024; Fridman, Norberg, Jonsson, & Paananen, 2024; Kucina, & Riekstiņa, 2024). For many innovators, especially those new to hackathons, this interaction is both energizing and enlightening—reflected in

the higher enthusiasm among first-time participants compared to experienced teams.

Hackathons also serve as launchpads for new business relationships. They help solution providers gain attention, validate their concepts, and identify piloting opportunities. The Fibenol Hackathon organizer noted how the format bridges academia and industry, giving students firsthand exposure to real-world challenges (Kepp, Veesaar, Liiv, & Aalto, 2024). This is particularly impactful for student teams, who often compete successfully against seasoned professionals. The GreenFly team from Kaunas Tech University, winners of the Nando Hackathon, exemplified this by integrating drone technology into a solution for overfertilization—earning praise for its practical alignment with client operations (Stanionytė & Popiera, 2024).

Learning Boosted by the Benefits of Networking

> *Our experience has been amazing. As foreigners in Sweden, it was valuable to visit and gain a deeper understanding of the culture while learning about recycling – the main focus of this hackathon. It gave us knowledge we can bring back to Poland. The hackathon also offered a great opportunity to network. The meetings with mentors and other participants helped us refine both our ideas and solutions. – Bruno Lopez, CEO at ReKorek, winner of Karlstads Energi Hackathon (Lopez, 2025.)*

Networking has emerged as a powerful catalyst for learning within the BioBoosters Hackathon framework, enabling solution providers to expand their knowledge through meaningful connections and collaborative exchange. Identified as both a gain and a pain reliever in the Value Proposition Canvases, the opportunity to build networks and discover services and funding avenues for idea testing has shown significant positive impact. Teams like N-Fix and Billerud AB emphasized how engaging with diverse perspectives and industry peers helped them break out of silos and sparked new ideas for future collaboration (Mernitz, Kiel, Stukenbrock, & Aalto, 2024; Hildén, Myhrén, & Persson, 2024). Survey data reinforces this, with 94 per cent of solution providers recognizing the hackathon as an effective tool for forming partnerships geared toward commercialization.

Hackathons that integrate multiple challenges, such as Cosun Beet and AdFiS, further amplify this learning effect by encouraging cross-topic dialogue and exposing participants to a wider range of expertise (Mernitz, 2025). These interactions not only enrich mentoring support but also help teams assess the long-term viability of their solutions. For instance, 80 per

cent of solution providers reported that the hackathon experience helped them evaluate the market potential of their ideas, with SMEs showing even stronger affirmation. Mentors from events like Alojas Hackathon noted that many teams gained clarity on how to develop their products further, while participants from Vinasse2Proteins and Vive Innovation described the process as a real-world testing ground for refining and validating their concepts (Kucina, & Riekstiņa, 2024; Mernitz, Kiel, Stukenbrock, & Aalto, 2024; Kuznowicz, Gajek, Sobolewski, & Aalto, 2024).

This learning-through-networking dynamic is further supported by academic insights, such as those from Granados, & Pareja-Eastaway (2019), which highlight the role of mentors in guiding teams through complexity, fostering design thinking, and encouraging iterative development. In BioBoosters Hackathons, mentors actively help teams navigate ambiguity, align creativity with feasibility, and shape solutions that are both innovative and grounded in client needs. Ultimately, the networking opportunities embedded in these events do more than connect people—they create a vibrant learning ecosystem where ideas evolve, partnerships form, and innovation thrives.

Is the BioBoosters Hackathons for Students?

> *At Nando hackathon I had the opportunity to meet like-minded people, mentors from the business world, to learn about the company from the inside, discover new career paths... Hackathons are not only useful, but also a decisive step in shaping a student's career. Often, the connections made during a hackathon become the starting point of a career. – Meda Surdokaite, Student, Kaunas Tech University*

A hackathon is an effective tool for promoting entrepreneurship among students, offering a hands-on platform to transform ideas into tangible solutions. It enables students to apply their theoretical knowledge in real-world scenarios, encouraging innovation and practical problem-solving. At the same time, hackathons allow universities to mobilize a large and diverse group of creative, multidisciplinary problem-solvers to address various societal, technological, and business challenges.

Participating in hackathons is undoubtedly valuable for students, as it helps them gain practical experience with real-world problems and supports their professional development. But is it equally beneficial for companies and challenge providers to select student teams? Can students compete with more experienced startups and research groups? Out of 246 applications to

BioBoosters hackathons, only six came from student teams, and just two were selected to present their proposals during the Hackathon days. Remarkably, one of these student teams managed to outperform more experienced competitors.

At Nando Hackathon focused on reducing overfertilization, a team of four students from Kaunas Tech University, called GreenFly, combined their expertise in electronic engineering, chemistry, programming, and drone piloting to develop the winning solution. Their victory came as a surprise, as they were competing against five highly skilled teams from research institutes and startups. Ultimately, the jury selected GreenFly's solution because it integrated seamlessly with Nando's operations by leveraging drone technology.

Nando is well known for promoting entrepreneurship, collaborating with universities, and actively engaging in various hackathons. They recognize the contributions that students can make, bringing new ideas and innovative thinking. According to Dr. Gintarė Grybauskaitė-Kaminskienė, R&D Project Manager of UAB Nando, student teams offer fresh ideas, mixture of skills and innovative solutions to complex challenges. Students are not afraid to try new things, their creative thinking often leads to solutions that are unexpected to professionals. Grybauskaitė-Kaminskienė reflects that this kind of approach is needed for innovation in today's fast-changing world.

According to Meda Surdokaite, a third-year student of Kaunas Tech University and a member of the GreenFly team, participating in hackathons is much more than just a competition for prizes, it is a unique opportunity to develop practical skills, get to know yourself in a professional environment and make valuable connections. Surdokaite continues to explain that the intensive format of the hackathon can help the students to discover totally new fields of interest. The format also requires quick decisions, creativity, the ability to collaborate and work under pressure – all qualities that are extremely important in any professional field.

The success of GreenFly is not an anomaly, but a signal of what's possible when students are empowered to innovate. With the right outreach and support, student participation can become a **core driver of innovation** in future BioBoosters challenges. To attract more student teams to BioBoosters hackathons, organizers should actively engage universities through partnerships with faculty and innovation centers, highlight success stories like that of the GreenFly team, and introduce dedicated incentives such as student awards, seed funding, or internship opportunities. Simple application procedures and upfront expectations or offering grants can further encourage participation. These measures can foster a vibrant, diverse, and innovation-

rich hackathon ecosystem that nurtures emerging talent while delivering value to industry partners.

Effective support can significantly enhance student participation in hackathons. Pre-hackathon onboarding through webinars or boot camps helps students understand business challenges and expectations. Before the competition starts, early access to industry mentors provides students with technical and strategic guidance but also boosts their confidence and ability to navigate complex challenges. Pitching a solution in front of industry leaders may be a first-time experience for many students. Therefore, structured support is essential to help them prepare and build confidence. Supplying technical resources like datasets, application programming interfaces (APIs), or business data enables more impactful solutions. These resources level the playing field between students and more experienced participants. Finally, clear evaluation criteria and timely feedback help students align their work with real-world needs and gain valuable learning outcomes.

Students represent a vast and dynamic pool of knowledge, creativity, and fresh perspectives. If companies wish to unlock this potential and help shape the next generation of bioeconomy leaders, BioBoosters could support this by organizing dedicated student-focused hackathons in collaboration with universities. These events could feature more targeted challenges, internship opportunities, and other incentives developed in partnership with challenge providers. Tailored mentorship, along with facilitated meetings between students and industry leaders, challenge providers, and support with technical resources, would further enhance the learning experience and support the development of impactful, real-world solutions.

Conclusions on the Value Creation to Solution Providers

Mentoring – from potential clients and specialists – can be highlighted as the most valued aspect of the BioBoosters hackathon process for the solution providers, especially when it facilitates access to cross-sectoral expertise. Networking and collaboration opportunities are also highly appreciated, with many teams benefiting from partnerships that support idea testing and commercialization—particularly in hackathons featuring multiple challenges, which encourage cross-topic innovation. The chance to validate business ideas and assess market potential is another key draw, with stronger impact noted among teams working with small and medium sized enterprises (SMEs). Direct communication with potential clients and the discovery of new business opportunities further enhances the hackathon experience,

especially for student teams who gain real-world exposure and professional development. Finally, solution providers consistently highlight the positive effect of hackathons on their visibility, especially in showcasing their technical and creative capabilities.

To sum-up, BioBoosters Hackathon fosters a collaborative environment where innovators and companies co-create solutions, exchange expertise, and build lasting partnerships. It transforms the innovation process from a solitary endeavour into a shared journey of discovery and development.

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Mentors Gain Influence and Insights to Industry Realities

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BioBoosters Hackathons managed to attract many specialists from business and research as mentors to guide the solution providers with their expertise. Mentors offer their expertise for the use of the solution provider teams to help them make the best possible co-operation offer for the challenge providers. Mentors help to solve the challenge and develop a viable business model for the solution technology. What is in it for the mentors? Let us review the key indicators and feedback survey results to find out!

Why become a Mentor?

BioBoosters Hackathon – Sharing your knowledge is a great learning opportunity. Expand your network and make an impact in green transition of business.

In BioBoosters, we argue that the mentoring experience not only allows mentors to make an impact but helps them learn at the same time. Mentors can explore in-depth the upcoming technology opportunities and assess the overall industry transition readiness by joining a structured and guided open innovation process. They can focus on learning and dialogue, build relationships across the business and scientific community in a respectful and collaborative environment.

As a long-term mentor of hackathons organised in Jamk University of Applied Sciences prior to the international piloting, Aki Finér, Director of Circular Economy at Motiva, shared his views of the mentoring experience and the benefit to a mentor (Aalto & Iso-Ahola, 2023). Finér described the hackathon as a valuable platform for fostering dialogue between the public and private sectors. Representing Finland's state-owned sustainable development company, Finér sees the event as a strategic opportunity to engage with businesses navigating the circular economy transition. Through his role as a mentor, he gains firsthand insight into the challenges companies face and the solutions being proposed—allowing Motiva to relay critical signals to public institutions such as ministries and agencies. Finér is particularly interested in

the maturity and business potential of the ideas presented, aiming to identify promising concepts that address systemic barriers to circularity. He evaluates whether these early-stage solutions could be scaled to benefit broader sectors of Finnish industry. Motiva's expertise adds depth to the assessment process, especially in understanding scalability and lifecycle management, helping teams unlock the full circular potential of their innovations while avoiding pitfalls that could hinder sustainability at later stages.

Based on the experiences of Finér and other mentors that worked with Jamk University of Applied Sciences, as well as the insights of the other partners into mentoring practices, the value propositions for mentors were outlined as a basis for the piloting and evaluation of the international BioBoosters hackathon model. The BioBoosters offer for mentors is

- Promote your professional know-how and position as a circular economy professional.
- Support the green transition to circular economy business models.
- Build your networks and get business connections.
- Support the launch of new research, development, and innovation (RDI) initiatives and projects.
- Learn from real-life business cases on circular economy transition.

Who are the Mentors?

> *Participating as a mentor in the BioBoosters Hackathon proved to be a highly immersive experience. Beyond imparting my experience to the participants, I had the opportunity to gain insights from their inventive ideas and problem-solving strategies. – Siim Teder, Estonian University of Life Sciences (Teder, 2023).*

In total, 185 mentors from nine countries and 83 organisations participated in the 18 hackathons. As shown in figure 1, the organisations of the mentors represent a balanced mix of industry expertise (41%), research-based knowledge (29%) and support for business development (26%). In addition, in some hackathons, there have been policy or advocacy representatives as mentors (4%) to provide insights into upcoming development opportunities, policies, and legislation in the sector. Challenge providers are included in the statistics as their role in the mentoring is essential for giving the overall direction to the solution development phase. The challenge provider company engages several own specialists to guide the teams in dialogue with the external mentors.

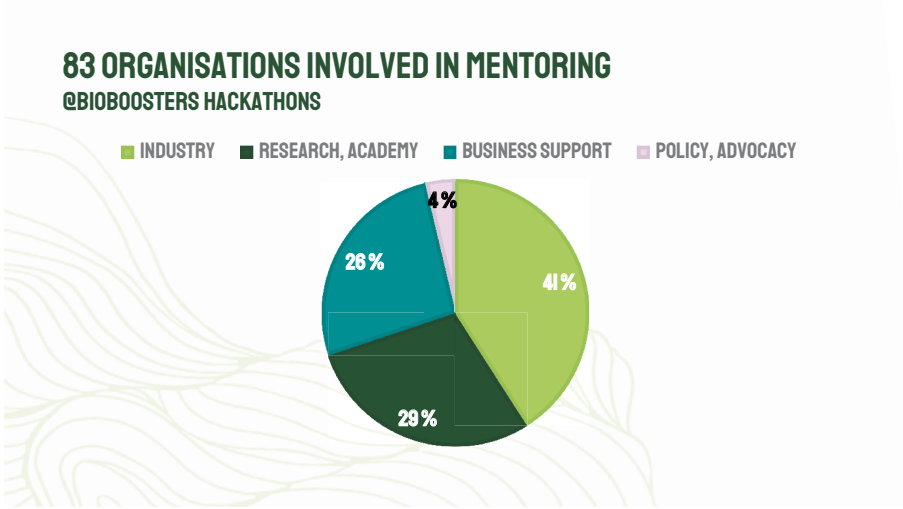

Figure 1. Background of the mentors' organisations

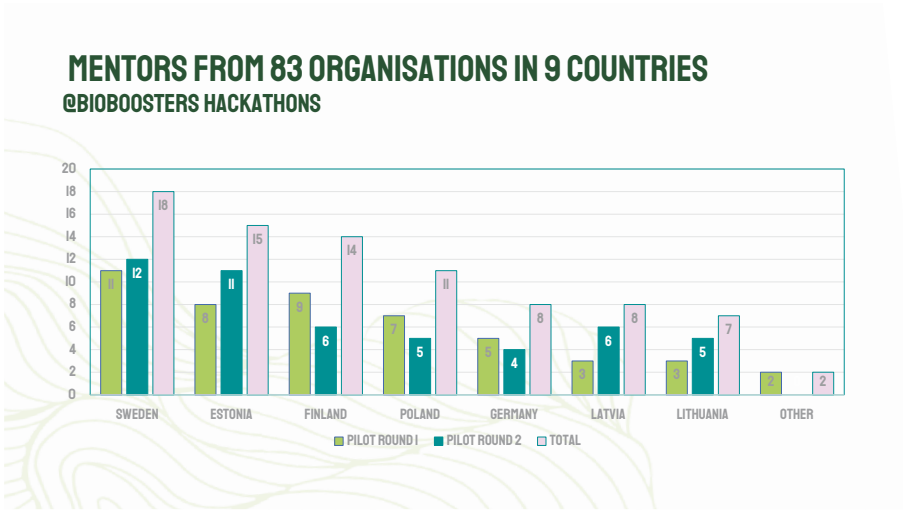

Figure 2. Country background of the mentors' organisations

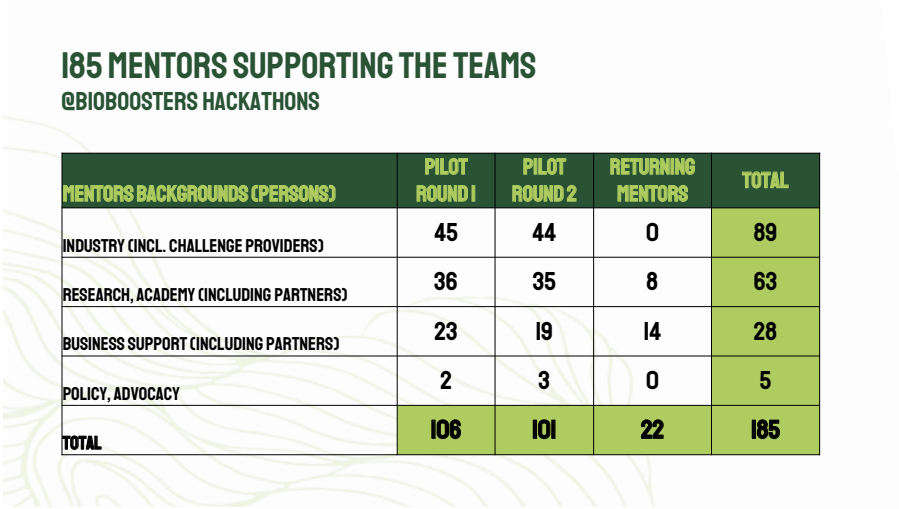

Figure 3. Background of the individual mentors involved

In most hackathons, there were also international mentors involved via the BioBoosters network. Share of international mentors grew in the second pilot round. As shown in the figure 2 and figure 3, many organisations and mentors involved in the first pilot round also returned to take part in the second-round hackathons. These numbers involve the organisers that have engaged their staff in the mentoring activities. Experienced mentors help to support the process flow by showing example to the first-time mentors and by bridging insights from other hackathons to help the teams – and challenge providers. Looking at the previous hackathon experience of the mentors (n=117) based on the feedback surveys administrated on the hackathon days, 39 per cent of the mentors were experienced while 61 per cent have been first timers (figure 4). Although, the organisers and network members offer a share of mentors, each hackathon challenge requires specialised know-how, which is why the share of repeated mentors from the industry remains low (figure 3).

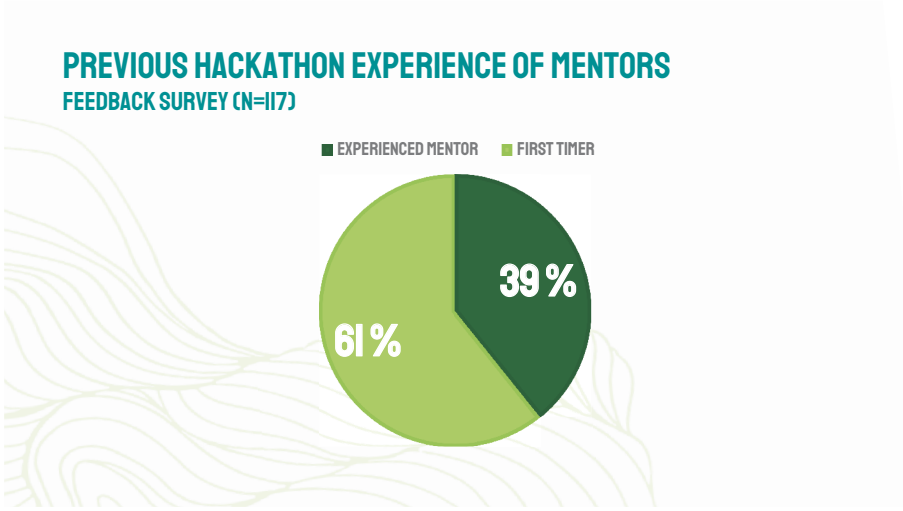

Figure 4. Previous experience of the mentors

All in all, mentors are selected based on their expertise, but success of the mentoring dialogue often also depends on personality. In his thesis conducted on the Kasvu Open (*Growth Open accelerator programme for SMEs*) mentoring program, Janne Roiha (2022) explored the elements of effective mentoring. He concluded that the mentor's role is to guide the mentee toward their own insights. A good mentor is open, eager to learn, and willing to be vulnerable. They must be genuinely present, enthusiastic, and able to inspire. Sometimes, the energy conveyed is more important than expertise, as the best insights emerge through shared experience. A mentoring session perceived as valuable can also plant the seed for long-term collaboration. (Aalto & Iso-Ahola, 2023.)

Mentors are the Most Satisfied Participants

> *Participating as a mentor in the Stora Enso Hackathon was a rewarding experience, both professionally and personally. The event offered a great blend of creativity, teamwork, and technical problem-solving, providing a platform for individuals to collaborate and generate innovative solutions to complex challenges. – Gunita Kiesnere, Head of New Building School, Vidzeme University of Applied Sciences (Kiesnere, 2025).*

Generally speaking, the mentors have been the most satisfied target groups in the BioBoosters Hackathons. Based on the feedback surveys, 96 per cent of the experts have expressed their willingness to participate in the same role in another BioBoosters Hackathon with this same organiser (the same result as in the first round) and 84 per cent (2 percentage points more in total than in the first round) their interest in participation as a mentor in another BioBoosters Hackathon organised in another country in the Baltic Sea Region.

Analysis of the results of the feedback surveys leads to the conclusion that hackathons have been effective in creative significant value for the participating mentors. Mentors are the group with the highest Net Promoter Score (NPS) score among all the groups surveyed: 70 score in the first piloting round (comparing to total NPS of 57) and 76 score in second piloting round (total NPS – 66). As shown in figure 5, from the data of the full 18 hackathons, 74 per cent of the mentors would recommend the hackathon to a friend or colleague, while only 2 per cent would be considered detractors with potentially negative comments to share.

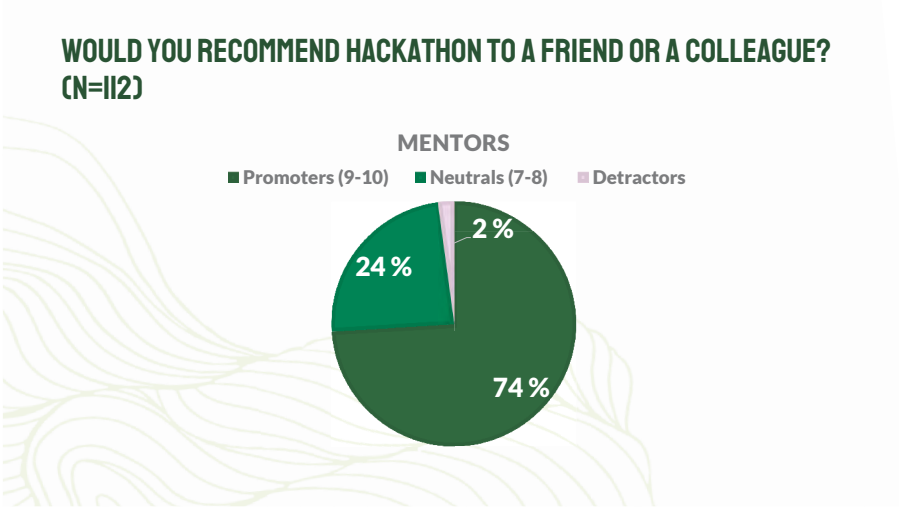

Figure 5. Net Promoters Score of mentors based on the feedback survey responses in 18 BioBoosters Hackathons

Where does the satisfaction come from? The feedback survey results indicate multiple value creation to mentors, although their main focus in the process is on the challenge provider and solution provider teams (n=113):

- 88% (82%) agreed that as a mentor they were able to make an impact on the innovation journey of the participating teams.
- 86% (78%) agreed that as a mentor they got the opportunity to learn on the real-world application of circular economy business models.
- 81% (75%) agreed that as a mentor they got visibility for my professional expertise.
- 81% (71%) agreed that as a mentor they got validation for their professional expertise.
- 80% (73%) agreed that as a mentor they got to grow relevant research, development, and innovation networks.
- 76% (75%) agreed that as a mentor they were able to make an impact on solving the challenge.
- 75% (64%) agreed that as a mentor they got to grow relevant business networks.
- 74% (67%) agreed that as a mentor they got to establish cross-sectoral networks.
- 73% (62%) agreed that as a mentor they got to establish international networks.
- 65% (62%) agreed that as a mentor they got the opportunity to join new co-operation initiatives.

In the brackets (%), the first-round results of the mentors' feedback survey are shown. As evident, there has been positive development in the experience of the mentors based on the lessons learned and implemented in the first round. This also proves that the satisfaction of this group has increased in 2024–2025 piloting round. This is visible even more in the results for specific hackathons with 100 scores granted by mentors participating in two events (Refal and Toksika Hackathons) while there were no scores of 100 in the first piloting. It can be assumed that the recommendation from mid-term review (Olesiak, Sobolewski & Aalto, 2024) related to adjusting the process in order to improve mentors' satisfaction has been implemented.

After the first-round evaluation, the BioBoosters partners emphasised these aspects to offer a greater value to mentors:

- Provision of consistent guidance to mentors on their role in the process in line with the mentoring guidelines.
- Improved visibility for the mentors with a dedicated LinkedIn post featuring the mentors on the BioBoosters channel.
- Enhanced dialogue between challenge providers (jury) and mentors on the Hackathon days.
- Early engagement of mentors to ensure their involvement from the Kick-off onwards.
- Increasing the share of international mentors.
- Ensuring time for networking and preference of onsite mentoring.

It is clear that mentors need the full attention of the organisers as their role in value creation to solution provider teams – and the whole process – is invaluable. Mentors participating in BioBoosters Hackathons consistently report high levels of satisfaction, with enthusiasm for future involvement continuing to grow. They are the stakeholder group with the most positive and steadily improving feedback, particularly valuing the opportunity to contribute meaningfully to team development and challenge resolution. Those involved in hackathons with a challenge from small and medium sized enterprise (SMEs) tend to perceive greater benefits compared to mentors supporting large enterprises, likely due to the more direct and dynamic nature of collaboration.

Key areas of value include business development, international networking, RDI engagement, and cross-sectoral exchange—all of which have shown increased satisfaction since the first piloting round. Hackathons that incorporate multiple challenges and require diverse expertise are especially effective in fostering collaboration and expanding mentors' roles beyond the event itself. However, only 65 per cent of mentors feel they are given opportunities to join new cooperation initiatives, indicating room for improvement in post-hackathon engagement.

Mentors with prior hackathon experience are notably more optimistic about the opportunities these events offer, and many confirm that hackathons serve as valuable learning environments—particularly in understanding open innovation and applying circular economy principles. To further enhance mentor and solution provider satisfaction, it is recommended that the mentoring process be reviewed and refined. This includes tailoring session lengths to team needs, allowing time for reflection between sessions, and considering the addition of concluding mentoring rounds to consolidate insights and guide next steps.

Making an Impact by Mentoring

> *The impact of the BioBoosters hackathon relies in the practical value because, a lot of the things that are proposed here today, they won't stay on paper or, you know, in a slide deck because many of the teams will actually continue their collaboration with Fibenol. … I think it's a very practical way to step away from your everyday research projects and to actually interact and work together with other similar teams and provide some practical value to real life issues that the companies face in the sector. Because quite often academia as a whole is accused of being too far from industry. These kinds of events actually help bring all the stakeholders around the table together and target these real issues that need solving. –Ene Viiard, Mentor, Fibenol Hackathon (Viiard, 2024).*

Within the framework of the BioBoosters initiative, the Fibenol and Nordic Hemp hackathons have emerged as good examples of how well-designed innovation events can drive sector-wide transformation (Kepp, 2025; Kepp, Veesaar, Liiv & Aalto, 2024). These events not only demonstrated the power of open innovation and cross-sector collaboration but also underscored the critical role of mentorship, particularly through the strategic involvement of the Estonian University of Life Sciences (EMÜ). Together, they offered a compelling model for how academic institutions can act as long-term enablers of innovation in the bioeconomy and beyond. EMÜ's mentorship approach exemplifies how academic institutions can serve as key agents of knowledge transfer and innovation. As highlighted in recent research by Martins & Faciola (2025), mentoring in innovation ecosystems is most effective when it is relational, iterative, and embedded in real-world problem-solving. EMÜ mentors have played a vital role in translating scientific insights into practical applications, supporting systems thinking in complex bioeconomy contexts, and ensuring long-term continuity through sustained research and educational engagement. This approach ensures that hackathons are not isolated events but integral components of a broader innovation journey.

To institutionalize this model, EMÜ launched a mentoring pilot program aimed at strengthening its internal and external capacity to support innovation and collaboration. The initiative focuses on training mentors across disciplines, fostering a culture of knowledge sharing, and aligning mentoring activities with EMÜ's strategic goals in bioeconomy and sustainability. This framework has been particularly impactful in BioBoosters events, where mentors—ranging from researchers to industry experts—acted not only as advisors but also as co-creators. These events brought together diverse participants

in international, face-to-face settings that encouraged creativity, critical thinking, and rapid iteration. A key strength of the format was the visibility of the entire development process, supported by hybrid collaboration and dynamic mentorship. Many mentors continued their engagement beyond the events, supporting pilot projects, joint research proposals, and long-term academic-industry partnerships. This sustained mentorship model has proven to be a key driver in transforming early-stage ideas into practical, impactful solutions and serves as a replicable model for institutional capacity building in innovation ecosystems.

Transformative Challenge Design: Beyond Problem-solving

The Fibenol and Nordic Hemp hackathons, organized by the EMÜ Centre of Bioeconomy, embraced a transformative approach to challenge design (Kepp, 2025; Kepp, Veesaar, Liiv & Aalto, 2024). Rather than focusing narrowly on solving predefined problems, these events framed their challenges around broader sectoral ambitions, such as advancing the circular bioeconomy, promoting sustainability, and accelerating bio-based innovation. This shift from a ”solve our problem” mindset to a ”transform the sector” perspective had a profound impact on both the process and the outcomes. By embracing open-ended, visionary goals, the hackathons encouraged systemic thinking and attracted a diverse mix of participants and mentors from multiple disciplines. The result was a richer innovation environment that fostered bold ideas, cross-sector collaboration, and deeper ecosystem-level engagement.

These experiences align with recent academic research, which emphasizes that hackathons are most impactful when designed as collaborative, interdisciplinary, and international learning ecosystems. Studies highlight the importance of hybrid formats, structured mentoring frameworks, and experiential learning environments that foster rapid innovation and cross-cultural collaboration. EMÜ’s mentoring approach, combining academic depth, sectoral expertise, and international collaboration created a multi-layered support system that extended far beyond the events themselves.

Notably, findings from global neurosurgery hackathons further validate this model, demonstrating that early-stage collaboration, mentorship, and cross-border innovation are critical for building global networks and addressing complex challenges (Barana et al., 2025; Razak et al., 2024). Together, these perspectives reinforce the effectiveness of BioBoosters hackathon-based innovation model in advancing both local relevance and global impact. The

study by Granados and Pareja-Eastaway (2019) also highlights the critical role of mentoring in innovation-focused learning environments such as hackathons. Mentors help scaffold learning by guiding participants through ambiguity and complexity, support design thinking processes during early-stage ideation and prototyping, as well as encourage reflection and iteration key elements for developing viable, user-centred solutions. These insights align closely with the BioBoosters experience, where EMÜ mentors played an active role in helping teams frame and reframe their ideas, balance creativity with feasibility, and develop solutions that were both technically sound and grounded in real-world needs.

Takeaways from the EMÜ Approach to Mentoring

The Fibenol and Nordic Hemp hackathons demonstrated that when designed thoughtfully, hackathons can be more than short-term innovation sprints, they can become catalysts for long-term transformation.

- The Fibenol and Nordic Hemp hackathons demonstrated that, when thoughtfully designed, hackathons can evolve from short-term innovation sprints into catalysts for long-term transformation. Several key lessons emerge:
- Mentoring matters: EMÜ's strong academic mentor pool played a crucial role in helping teams succeed and form lasting partnerships.
- Challenge design is critical: framing challenges around broad, sector-wide goals inspired more creative thinking and led to solutions with greater real-world impact.
- Diverse expertise strengthens outcomes: a mix of academic, industry-specific, and international mentors created a well-rounded support system.
- Follow-up is essential: continued support after the hackathon, through mentoring, collaboration, and funding, was key to turning promising ideas into real-world projects.
- Global collaboration adds value: cross-border engagement brought new perspectives and expanded opportunities for cooperation.
- There is no single winner: the format emphasized learning, collaboration, and real-world impact over competition. Every team had the opportunity to succeed in different ways through partnerships, pilot projects, or continued development.

Together, these lessons from systemic mentoring and transformative challenge design offer a clear roadmap for how academic institutions, companies, and innovation ecosystems can leverage hackathons as strategic tools. By embedding mentorship, fostering interdisciplinary collaboration, and framing challenges around sector-wide ambitions, hackathons can evolve into powerful platforms for sustainable development, innovation, and long-term impact. EMÜ's experience demonstrates how this approach can drive meaningful change in the circular bioeconomy—and serve as a model for broader application across sectors and regions.

Concluding the Compelling Payoffs of Mentoring

> *What I really like about the Hackathon format is that each team brings its own ideas in response to the challenge, sometimes matching it 100 percent, sometimes less. I also really appreciate the mentor system. The mentors support the teams and help them gain new perspectives on both their own ideas and the challenge itself. There's also a strong network that forms between the teams and mentors creating a dynamic exchange. This format allows for even more connection and idea-sharing than other formats I've experienced. – Christopher Wolf, Kayser Automotive Systems GmbH, mentor in AdFiS Hackathon (Wolf, 2025.)*

Mentors in BioBoosters Hackathons play a pivotal role in shaping innovation outcomes while simultaneously advancing their own professional goals. Their core tasks include establishing dialogue with the business sector, building business networks, and deepening their understanding of green transition challenges across industries. These engagements allow mentors to explore systemic barriers to sustainability and contribute to identifying viable solutions. Hackathons also serve as a platform for personal branding, positioning mentors as specialists in their fields.

The gains for mentors are equally compelling. They have the opportunity to use their expertise to make a tangible impact on emerging solutions, while receiving validation for their professional know-how through team feedback and challenge provider recognition. Participation fosters the growth of business networks and offers early leads on potential Research, Development and Innovation projects and partnerships. Importantly, mentors can pitch their own services and capabilities, opening doors to future collaboration initiatives. These benefits make hackathons not only a space for guiding innovation but also a strategic arena for mentors to expand influence, build connections, and contribute meaningfully to sustainable transformation.

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Perks and Gains of the Process Guide

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On first sight, the role of the organiser in a hackathon does not seem to be the most exciting one. As the process manager, timekeeper and facilitator, the organiser is often in the background. Still, there are many gains for the organiser that keeps us starting (again and again) the roller coaster ride of stress, relive, and joy.

In this article, the authors provide an outlook of the experience of the hackathon organiser exploring what expectations the organisers had to start with, what benefits were gained and what was the added value of the network co-operation for the main organiser. The analysis is based on feedback survey data collected from the 18 hackathons organised in the BioBoosters project (Interreg BSR, 2023–2025). Discussion is complemented by reviewing the interviews with the organisers published after each hackathon.

Hackathon Organisers come from Diverse Backgrounds but Unified Regional Role and Mission

The BioBoosters project united nine organisations that would all have the same role in the project. They would be hackathon organisers – delivering two hackathons as main organisers and supporting the network partners in organisation of 16 hackathons. Some of the organisers were already experienced in delivery of hackathon processes while some were first timers.

The backgrounds of the organisations were diverse. Paper Province and BioFuel Region are cluster organisations. Vidzeme Planning Region is a regional authority and development agency. Sunrise Tech Park and WITENO GmbH are science and business parks. PRO CIVIS Foundation is a non-governmental organisation (NGO). Pärnu County Development Center is a business support organisation. Jamk University of Applied Sciences and Estonian University of Life Sciences are academy and research institutions… What all of these organisations have in common is that they act as innovation intermediaries, connectors, in their regional bioeconomy innovation ecosystems.

The role of these innovation intermediaries is to be catalysts for co-operation and implementation of the smart specialisation strategies steering green, digital and circular transition in the bioeconomy sectors. Hackathon is a tool to get this job done.

Expectations were high for regional impact and gains of the network collaboration

Before the hackathon piloting started, the hackathon organisers came together to outline the expected value creation to different target groups of the hackathon – including the organisers themselves. The partners jointly co-created the value proposition to the organiser. This proposition was to be tested in the course of the piloting to discover how well the experienced value of the hackathon organisers would match the expectations. The purpose of a **Value Proposition Canvas** was also to build the ground for communication plan and evaluation plan by clarifying and clearly articulating the created value for the organisers in simple terms relatable to this target group. Whether defining communication messages or feedback survey questions, it was an important starting point to establish joint and explicitly outlined assumptions of the needs and motivations of the organisers to guide the piloting process.

As outlined in the Value Proposition Canvas, the organisers expected that a hackathon would support their role as a connector in the regional innovation ecosystem. They expected that the hackathon would be a good tool for them to (Olesiak, Sobolewski, & Aalto 2023):

- Support the internationalization and growth of the regional SMEs.
- Support the green transition of the regional business sector.
- Offer as a meeting place for the regional innovation system.
- Connect the regional innovation system to strategically significant networks supporting the implementation of the smart specialization strategy.
- Offer open innovation processes to promote new business opportunities in the region.
- Offer matchmaking services to find solution providers for businesses.

The expectations of the BioBoosters partners were based on the previous experience in hackathon organising as well as the anticipated opportunities related to the network co-operation. Value proposition design was also affected by the joint study visit to benchmark the Krinova Food Hack which helped

to position the BioBoosters hackathon value offer by providing a chance to compare with another open innovation model.

Based on previous experiences, the partners concluded that the common pains of a hackathon organiser are:

- Growing competition between open innovation services and it is difficult to attract challenge providers.
- Lack of tangible business or green transition impact from the hackathons as well as low business sector involvement.
- High efforts in attracting solution providers and/or mentors.
- Lack of standardization of the process; high costs of organisation.
- Lack of effective communication channels and partnerships.
- Lack funding models to support the Hackathons.

The expectation was that with the network co-operation model and the proven business-driven open innovation process already piloted successfully at Jamk University of Applied Sciences, the pains of the organiser would be relived while many gains could be achieved compared to hackathon organising without the network support. In the piloting done at Jamk, it had been established that the business-demand driven model had relatively high tangible business impact supported by a strong portfolio of references. Also, the organisers would get the access to this proven process knowledgebase and organisers' materials. All organisers would operate with professional digital platforms for running the hackathon process.

In addition, it was expected that the organisers would benefit from the network co-operation model. As the network is built of strong, complementary, bioeconomy regions, the partners can offer cross-sectoral know-how and connections to each other's hackathons supporting search of solution providers and mentors. With all the interconnected communication channels, the 'network of networks' would also provide a high visibility for communication actions. Together, the partners would build an international brand to support communication activities of the hackathons and the promotion of the hackathon service in the long-term. Finally, the organisers saw the ability to learn from each other during the process preparation and implementation as an important gain.

All in all, the expectations of the organisers can be summarised to the following value propositions (Myhrén, Lehtomäki, & Aalto, 2023):

- Support green transition and boost circular bioeconomy business opportunities for client companies.
- Scout expertise and market the hackathon via international and cross-sectoral networks.
- Join a high-profile hackathon brand with proven service model and impressive references.
- Gain international recognition for your organisation's know-how and region's smart specialisation areas.
- Help to initiate business-driven RDI co-operations to drive green transition

Bottomline – Hackathon gets the Job done

When asked if the hackathon resulted in discovery of a promising solution to the presented challenge, 100 per cent of the organisers responded a significant impact while 90 per cent were positive that an innovation partnership would be launched on the basis of the hackathon (n=49). The numbers demonstrate that the organisers were able to provide an impactful service to their client; a promising premises for matching an innovation to solve the presented challenge can be established with the hackathon.

Beyond the single client, the organisers saw wider benefits to the innovation system. 100 per cent of the organisers (n=47) respondent that their organisation was able to support the innovation journey of the participating teams. Furthermore, the organisers reported positively on the wider impacts of the hackathon process. On the organisers feedback survey administrated in the hackathons (n=45):

- 98% agreed that BioBoosters hackathon supports green transition in the Baltic Sea Region.
- 98% agreed that BioBoosters hackathon supports growth in the bioeconomy sectors in the Baltic Sea Region.
- 96% agreed that BioBoosters hackathon supports exchange and transfer of best practices across the Baltic Sea Region.
- 96% agreed that BioBoosters hackathon initiates business-driven research, development, and innovation activities in international context.
- 93% agreed that BioBoosters hackathon initiates business-driven research, development, and innovation activities in national context.

These outcomes suggest that BioBoosters acts as a gateway to structured, business-driven collaboration aligned with broader green transition goals. All in all, the relevance to the organisers can be best highlighted by the fact that 100 per cent of the organisers were confident that their organisation would organise more hackathons after the project. As reflected by Inguna Kucina from Vidzeme Planning Region, the BioBoosters hackathon format excels at quickly connecting challenge provider companies with solution providers and ready-to-market products. Furthermore, the hackathon provides a platform for innovative ideas that may need further data and testing before they can be implemented. (Kucina, 2025.)

Reaching the Right Contacts via the Network

> *Leveraging partnerships, especially international and cross-sectoral ones, brings in diverse perspectives, resources, and expertise, which are invaluable. – Lina Stanionyte, Sunrise Tech Park (Stanionytė, 2025.)*

For the organiser, one of the most concrete benefits of the network co-operation, and one of the most stress-relieving ones, is the collaboration in the active scouting of solution providers and mentors. This benefit is cited by several organisers directly in the pilot story interviews as the network has demonstrated its growing capacity to attract international teams and mentors to the hackathons (Uusen, 2024; Mernitz, 2024; Stanionytė, 2024; Kucina, 2024; Aalto, 2024; Kepp, 2024). Considering that on average 80 per cent of the potential solution providers (applicants of the open call) and in practice 100 per cent of the mentors are reached via direct contacting, the active scouting is crucial to the success of the whole hackathon process. The ability to connect with experts through established scouting mechanisms significantly reduces organisational burden while improving quality of participation.

During the piloting, some variation between hackathons was experienced on the success to attract international solution providers and mentors; however, all in all, the share of international applicants and mentors rose while the piloting proceeded. Looking at the feedback survey responses, in the first pilot round 89 per cent of the organisers (n=27) reported positively on the network support to finding solution providers, while after the second round, the total percentage of positive responses (two rounds, n=47) had risen to 94 per cent. This is consistent with the numbers of international applicants with 44 per centage of international applicants in the first round compared to 62

percentage on the second round (figure 1). The responses on the BioBoosters network support for finding mentors stayed more consistent with 83 per cent of organisers reporting essential support in attracting qualified mentors.

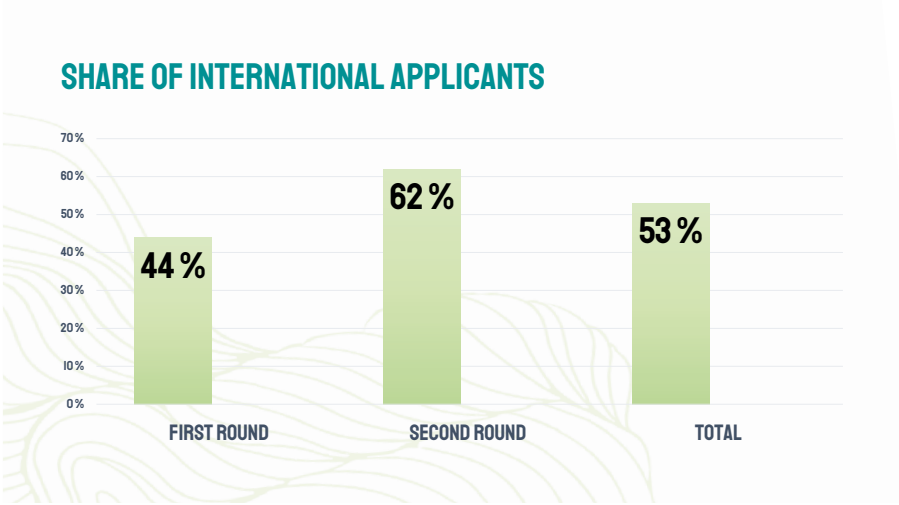

Figure 1. Share of international applicants in BioBoosters hackathon piloting.

To illustrate the effect of active scouting co-operation in the international network to the outcomes of the whole hackathon process, let us consider three open calls of the second pilot round – LiukasHackathon, Stora Enso Hackathon and Toksika Hackathon. In autumn 2024, Jamk University of Applied Sciences organised a hackathon with Kuljetus Tero Liukad Ltd to discover digitalisation solution for nutrient logistics. LiukasHackathon call attracted 15 applications – six from Finland and nine international. However, only one Finnish team was selected and this team eventually dropped-out – if the open call had been implemented nationally, none of the five finalist or three winners would have been involved in the hackathon. Although, it was initially considered to be more nationally targeted hackathon due to the conditions of the intended project funding to develop the resulting solution idea, the hackathon resulted in three international winners that together can provide a holistic solution concept to a complex digitalisation challenge. (Aalto, 2024.)

Second, in autumn 2024, Vidzeme Planning Region organised a hackathon for Stora Enso to tackle two key challenges during the summer to maintain

wood quality: preventing blue stain caused by fungi and combating wood-boring insects. While these challenges were found high relevance in the wider industry EU-wide, the solutions were lacking from the market causing high stress to the organising team. Finally, after network efforts, the open call for Stora Enso Hackathon attracted nine applications of which only two were from Latvian teams (and even one of those teams was a Latvian-Sweden co-operation team). However, due to network support, instead of a competition of two teams, Stora Enso got range of innovative solution proposals from Latvia, Sweden, Finland, Ukraine and Turkey. (Kucina, 2025.)

Lastly, Toksika Hackathon demonstrated that looking beyond the borders for solutions might open a vast range of market-ready and pilot stage solutions. Active scouting efforts in e.g. Germany and Finland quickly provided 4 and 4 applications respectively to the Toksika Hackathon open call. All in all, Toksika Hackathon open call attracted 20 applications from 10 countries; 75 per cent of the applications were international. The winning solution came from Germany – market ready solution found via international scouting. Sensatec GmbH impressed the jury with its integrated approach: combining advanced technologies with tailored products like microbes, biopolymers, and reagents for effective soil decontamination. (Stanionytė, 2025.)

> *We were really impressed with how LiukasHackathon got international teams to participate in the competition. There is a wider need for the solution to be developed both domestically and internationally, so it is great that the solution brings together experts from different countries. Hackathons are also an excellent opportunity for us to show what Jamk can offer to hackathon participants, clients and others who develop business and solutions: expert services, networks, amazing testing environments in laboratories and on the Bioeconomy Campus. – Minna Lappalainen, Director of the Bioeconomy Institute at Jamk University of Applied Sciences. (Lappalainen, 2024.)*

Saving Time and Effort with the Established, Professional Process Flow

The strength of the BioBoosters model lies in its systematic process, comprehensive documentation, and capacity for peer learning. Organisers benefit from a scalable, well-supported innovation service concept that significantly reduces the complexity of planning and execution. At any time of the process, the organiser has a lot of tasks on their plate. As time is often the most limited resource, it is worth to focus the time resources of the

organiser for the most value adding tasks that ensure the value creation to challenge provider, solution provider and mentors. Having the documentation, communication templates, digital tools and process know-how ready offers the organiser a chance to focus on what matters.

With this framework, first-timers have been able to replicate the process – and its value propositions to the target groups – with the support of more experienced organisers. As shown in figure 2, organising team is likely to have changes along the way, so a continuous guidance and peer support structure can be valuable also for organisations that have already carried out one hackathon. As remarked by Lina Stanionytė after key staff changes between the first and second pilot round, clearly defined steps, practical checklists, and a well-organized hackathon path and regular meetings with BioBoosters partners offered valuable guidance throughout the process for the first timer organisers. While normally organising an international co-operation process and open innovation event for the first time can be overwhelming, the structured approach provided by the BioBoosters framework made it all fluent for Sunrise Tech Park. (Stanionytė, 2025.)

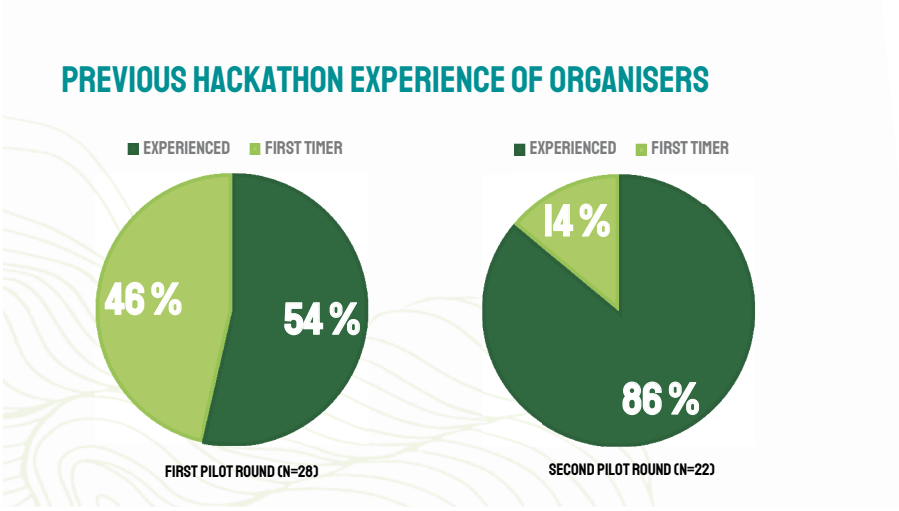

Figure 2. Previous hackathon experience of the organisers taking part in the Bio-Boosters hackathon piloting.

Looking at the results of the organisers' feedback survey administrated at the hackathons, the organisers have reported positive value from the process support and organisers' toolbox available for BioBoosters network (n=47):

- 96% had been able to apply the ready document templates of the hackathon process.
- 91% agreed that Howspace (digital platform used with hackathon participants from Kick-off to Hackathon days) added value to the hackathon process.
- 87% agreed that the BioBoosters hackathon communication plan had helped them.
- 83% agreed that the organisers' checklist (MS Planner with all the tasks of the organiser during the process) had helped them.

Moreover, it is worth to note that these resources are not static assets; they are part of a living toolbox updated through continuous peer exchange and post-event feedback. BioBoosters network – in piloting and in the long-term model – fosters co-creation between organisers, enabling peer learning and shared refinement of the concept. The result is a hackathon methodology that evolves through collective experience while remaining adaptable to local contexts. Even though practice helps, one can always expect the unexpected with a hackathon. With the support of experienced organisers, there is always practical insights and experience available to help the organiser navigate the arising problems and surprising turns of events.

> *Organizing this year's hackathons was notably smoother, thanks to the valuable experience gained from the nine successful events held last year, which delivered tangible results and greatly expanded our network of collaborators. However, each year presents a unique set of challenges for the organizers, as the conditions and dynamics shift with every new sector and problem addressed. – Inguna Kucina, Vidzeme Planning Region (Kucina, 2025.)*

Visibility, Recognition, Contacts – Is Hackathon a Launchpad for Co-operation also for the Organiser?

It can be argued that organising a BioBoosters hackathon reinforces the profile and position of an innovation intermediary organisation bringing visibility to the organiser and their regional smart specialisation areas. Based on the organisers feedback survey, 100 per cent of the respondents agreed that their organisation got positive visibility for their expertise and know-how via

organising a BioBoosters hackathon (n=47). This visibility not only fosters institutional reputation but also opens doors to strategic collaborations and funding. In fact, 100 per cent of the organisers agreed that their organisation gained new valuable connections via the hackathon. When asked if their organisation got an opportunity to join new co-operation initiatives, 93 per cent responded positively.

As reflected by Katrin Kepp, Estonian University of Life Sciences, for a university, the BioBoosters hackathon effectively bridges the gap between academia and industry making researchers more aware of the market needs and realities. Hackathon catalyses co-operation by creating a rich network of professionals who can support and enhance each other's work leading to long-term partnerships and innovative projects that extend beyond the hackathon itself. (Kepp, 2025.)

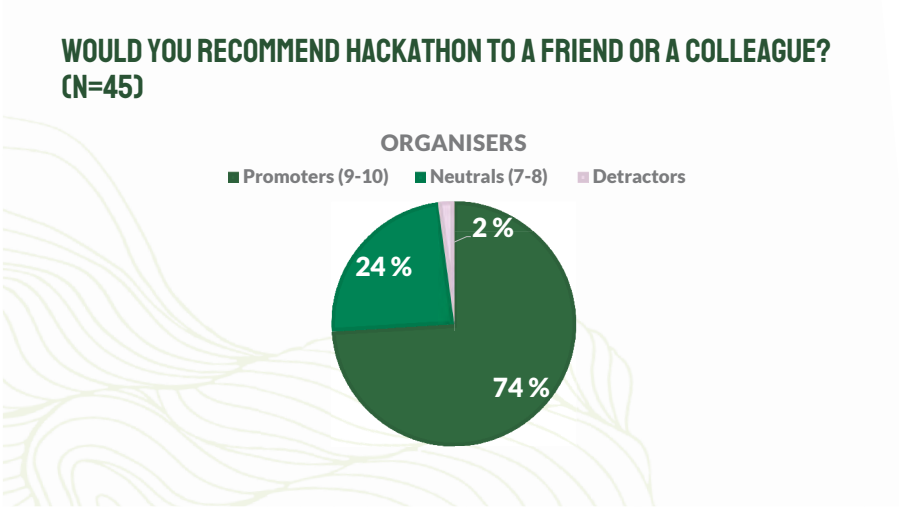

Figure 3. Net Promoter Score of BioBoosters hackathon organisers (n=45).

Perhaps the most notable showcase of the organisers' satisfaction with the process is that all of the nine organisations are planning to continue their hackathon service provision. The organisers involved in the piloting are happy to take another round – and to engage their colleagues along, as shown with the net promoter score (figure 3). When asked if they were willing to recommend hackathon to other organisers, 74 per cent would be clear promoters, while the share of detractors is only 2 per cent.

Connectors Live on Connections

Having a strong co-operation is key resource for an organiser. As reflected by Gudrun Mernitz, WITENO GmbH:

> *Compared to the first round, the collaboration had clearly matured. Everyone knew exactly what to do, and where their contribution would have the most impact. That clarity allowed us to focus our energy on finding the right experts, while the partnership took care of activating their respective networks. Finally, the personal relationships we've built within the partnership played a big role. By now, we know and trust each other very well. That mutual respect and shared motivation to achieve the best possible results made the process smoother and more rewarding, especially during the intensive and sometimes difficult search for the right solution providers. (Mernitz, 2025.)*

The BioBoosters network provides a uniquely structured and effective support system for hackathon organisers. By offering coordinated scouting, communication amplification, standardised tools, and access to long-term collaboration, the network transforms a high-effort innovation activity into a strategic, low-barrier opportunity for regional impact. As evident from the strong organiser satisfaction and consistent outcomes, this model demonstrates the power of distributed networks in delivering business-driven, sustainability-oriented open innovation at scale.

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Theme 4

Impact of BioBoosters

Hackathon as a Launchpad for Innovation Co-operation

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Bottomline of the BioBoosters hackathon is to launch an innovation partnership. This article explores how impactful the hackathon process has been in this mission – and why some take-offs require more time than others.

Each BioBoosters hackathon starts with the need of a challenge provider to find business and innovation partners and technology solutions to tackle a concrete challenge connected to transitioning to circular bioeconomy. This is a premise on which the organisers attract first the challenge provider company, and next the solution providers to join the process. The hackathon invitation designed jointly with the challenge provider clarifies what kind of co-operation opportunity the winner(s) of the hackathon will have with the challenge provider, e.g. a joint development project or jointly piloting a new technology or process.

The following analysis examines to what extent the BioBoosters hackathons were able to actually serve as launch-pads for co-operation. The analysis studies and presents the multifaceted types of co-operation resulting of the 18 hackathons. After one year had passed of the first-round hackathons (9), a survey was administered to the organisers to explore what progress had been made after the hackathon. In addition, the impact stories published were used as a reference. Many co-operations had launched; however, the final destinations of several started journeys are yet to be revealed. Although, the main expected outcome of each hackathon is a co-operation launched between the challenge provider company and the winning team, in practice the connections made, and co-operations initiated are numerous and of a versatile nature.

Who are the Winners?

In the 18 BioBoosters hackathons, 23 solution provider teams were selected as winners to initiate an innovation partnerships with the challenge providers. As shown in figure 1, in the BioBoosters hackathons implemented in 2023–

2025, the majority of the winners came from industry – 18 per cent were large enterprises and 52 per cent SMEs including startups – while 22 per cent represented research groups. Among the winners, there was also one student team and one business-research co-operation team.

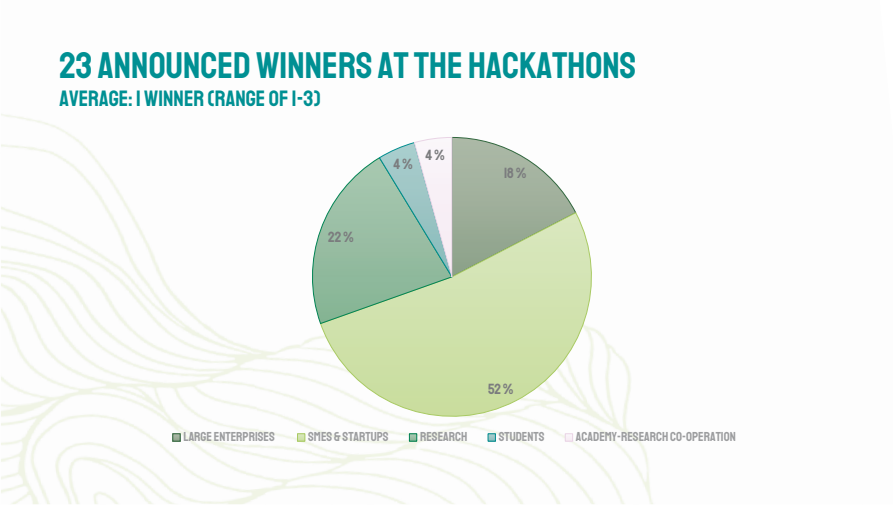

Figure 1. Background of the 23 winners of the BioBoosters hackathons.

At the winners' announcement, excitement is high, but the work is only about to start. The success of the co-operation will depend on many internal and external issues that are not all foreseen in the hackathon process. All innovation journeys take time. Generally speaking, one could assume that when the co-operation is started with a research team, the journey can be expected to be longer, as the technology readiness level is lower. This is, however, not always the case as explored in this article.

The Expected Co-operations: the Challenge Provider and the Winner

As outlined in the introduction, the most anticipated and expected co-operation resulting from the hackathon is naturally the co-operation between the challenge provider and the winning solution provider team. In the concept design phase, the challenge providers have been profiled as well-established

and preferably large enterprises located and operating in the Baltic Sea Region that have been facing sustainability challenges or have been looking for the incorporation of the circular bioeconomy principles in their daily operations. Meanwhile, the solution providers have been profiled as mainly technology provider SMEs looking for growth opportunities in cross-sectoral or international markets; although, variation of backgrounds and organisation types was foreseen to be high for the solution providers.

Let us take a brief overlook of some of the most interesting co-operation activities already undertaken by the BioBoosters hackathons between the challenge providers and the respective winning teams.

Delivered by Jamk University of Applied Sciences **the Valio Hackathon** was an effective launch-pad for new co-operation partnership to tackle a long-term challenge of identifying practical methods to mitigate seasonal variations in milk production. Managing the peak production allows for decreased processing and logistics capacity supporting Valio's mission of reaching a carbon-neutral milk production chain by 2035. As the first step, Valio and Elvenite – the winning team, started their co-operation in pilot scale in 2024. In the pilot, data sets from dairy farms with high and low seasonal variation would be analysed to better understand the root causes. As announced in October 2024, Elvenite utilized advanced data analysis, artificial intelligence (AI) and machine learning (ML) to analyse and understand the underlying causes of these seasonal variations. By comparing farms with different production patterns, they were able to identify which methods and conditions could potentially contribute to more consistent milk production. Valio was further planning to apply the lessons learned and consider strategic actions that could lead to a more stable production over time. (Iso-Ahola & Aalto, 2023.)

In the second example, **the Moelven Hackathon** delivered by Paper Province, co-operation was initiated between Moelven Wood and Billerud – the winning team. Both entities jointly embarked on a journey to develop a new packaging solution to replace the fossil-based plastic packaging of wooden panels for indoor use. In the end of the hackathon, Moelven Wood chose the fibre-based alternative despite knowing that the development face would take longer but the result had greater potential to match their sustainability agenda. The idea and the material exist, but the real challenge was to find a way to seal the ends and replace the effect of the existing shrink-wrap. In spring of 2024, both companies made the first test print of the packaging. The collaboration is a dynamic and ongoing process, with both companies working closely to refine and perfect the solution. Regular meetings, brainstorming sessions, and prototype testing are all part of the joint efforts towards creating a viable and

sustainable packaging solution. It is believed that the new packaging has the potential to make a change for the entire industry by demonstrating a more sustainable solution. (Hildén, Myhrén, & Persson, 2024.)

Image 1. Hackathon launched a co-operation between Moelven Wood and Billerud (Photographer: Fredrik Karlsson, Solsta Foto)

In the spring 2024, **the Cosun Beet Hackathon** delivered by WITENO GmbH, three winners were announced to start co-operation to convert different sugar beet processing residues to higher value. Each of the three proposed solutions required additional research and development, necessitating external funding. At this stage, CAPitalise Leaves team has already obtained funds from the Institute of Solution Providers (UFZ) and a pilot project is now underway. For the second project with Vinasse2Proteins, initial laboratory trials have already commenced. Furthermore, preparations are underway for a funding application to establish a demonstration plant in Anklam. Participation in the hackathon significantly contributed to regional support for these initiatives. It looks certain that Cosun Beet will reap the fruits of the hackathon still for many years to come as the ideas are tested and commercially scalable innovations emerge from the trials and launched co-operations. (Mernitz, Kiel, Stukenbrock, & Aalto, 2024.)

Image 2. Cosun Beet Hackathon (Photo: Filmvision)

In the final example, **the Nando Hackathon** delivered by Sunrise Tech Park ended in April 2024 with a surprise winner – a student team, GreenFly. GreenFly's team provided a concept for a drone technology, designed to scan fields and optimize fertilization while minimizing environmental impact. This concept aligned seamlessly with Nando's existing services, which include drone-based spraying, spreading and fertilizing. By integrating GreenFly's advanced field scanning and variable rate mapping capabilities with Nando's expertise in agricultural drone services, they could develop a comprehensive solution that not only enhances precision in fertilization, but also significantly reduces the environmental footprint of agricultural practices. In summer, 2024 GreenFly team was testing their solution. They carried out over 800 ha of scans with a multispectral drone, the obtained data were processed by assessing the viability of crops before and after the use of technologies. The resulting scans helped farmers see a more realistic view of their fields. Farmers used the processed data for fertilization, thus saving an average of 15 per cent of fertilizer and tens of thousands of euros. (Stanionytė & Popiera, 2024.)

The Less Obvious Co-operations: the Challenge Provider and the Other Finalists

When surveyed in May 2025 about their knowledge of outcomes of the first-round of BioBoosters hackathons (9 hackathons organised in autumn 2023 – spring 2024), it was evident that hackathon is a launchpad for a multitude of co-operations.

- Co-operation started between challenge provider and a finalist (including winners) reported in 7 hackathons.
- Co-operation started between two finalists reported in 2 hackathons.
- Co-operation started between a mentor and finalist reported in 3 hackathons.
- Co-operation started between a mentor and challenge provider reported in 3 hackathons.

It might be expected that the winning solution, selected according to evaluation criteria pre-established by the challenge provider, would be the clear choice for the challenge provider in terms of further co-operation. But, as the cases below exhibit, the challenge providers to the BioBoosters hackathons were also considering and were willing to enter into co-operation arrangements with the finalists that were not announced winners. Let us explore some examples.

In the hackathon delivered by Estonian University of Life Sciences, **Fibenol Hackathon**, solution provider finalists beyond the winning teams have also initiated collaboration with the challenge provider. Notably, a formal collaboration agreement has been signed with Research Institutes of Sweden (RISE), further expanding the impact and follow-up potential of the hackathon. Both entities, i.e. Fibenol and RISE began a partnership to explore new material applications for Fibenol's lignin and hemicellulose. RISE is testing these bio-based materials for use in coatings, adhesives, and barrier solutions, aiming to scale up promising results through joint R&D. (Kepp, Veesaar, Liiv, & Aalto, 2024.)

Secondly, as a result of **Võiste Hackathon**, delivered by Pärnu County Development Centre in spring 2024, one of the finalists, Mahlametsa OÜ, started quickly a co-operation with Võiste. Mahlametsa produced an innovative yellow tomato juice using Võiste's surplus tomatoes that were returned as unsold from retail. This unusual product attracted interest from local restaurants and inspired Võiste to consider launching a similar production line themselves, aiming to update their business model, expand

their product range, and reduce seasonality in their operations. (Uusen & Knuuttila, 2024.)

In the case of **Nando Hackathon**, Nando has collaborated with other finalists with promising solutions – DeepScientific & VakeWorks (Lithuania, Sweden, India) and Agrolinera (Spain). All the teams received Nando's products for testing, along with consultations on potential applications and partnerships in conducting research and evaluating outcomes. Deep Scientific, which proposed a solution incorporating advanced analytical tools for assessing nutritional values and soil composition through sensors, started measuring the impact of Nando's bio-stimulants on vegetable growth. As explained by Aušra Baradokė, CEO of Deep Scientific, tomatoes treated with the bio-stimulants have shown visible improvements, growing larger than those cultivated under standard conditions. (Stanionytė & Popiera, 2024.)

It is also worth to further explore the collaboration framework resulting from **the Valio Hackathon** delivered by Jamk University of Applied Sciences. As Development Manager of Valio, Hanna Castro, stated, Valio expects to have a better understanding of the factors affecting seasonal variation in milk production after completing the piloting with Elvenite (winner) and will be able to prioritise further steps and solutions needed. This shall allow for launching co-operation with other teams as well. Therefore, Valio has encouraged all participating teams to continue working on their ideas and to exercise further dialogue with Valio. (Iso-Ahola & Aalto, 2024.) As a signal of continuing co-operation, several of the Valio Hackathon finalists (e.g. Hamk University of Applied Sciences), and mentors (e.g. Jamk University of Applied Sciences, Faba) are part of the Food 2.0 Ecosystem of Valio aiming to create a Finnish nature-smart food system in which growth, profitability and added value are built on the basis of sustainable production. The Food 2.0 project has been granted EUR 10 million funding in Business Finland's challenge competition for leading companies. Valio is the first food company that Business Finland has chosen as a leading company. (Valio, 2025.)

A Co-operation with a Slow Launch: The Targi Kielce Case

To review why the co-operation launch sometimes takes its time, let us also review the outcomes of the **Targi Kielce Hackathon** delivered by PRO CIVIS Foundation for Education and Social Dialogue in spring 2024. With the challenge *'ReCover Approved by Nature'*, Targi Kielce – one of the leading trade fair centres in Central and Eastern Europe – started looking for solutions to replace or recycle the single-use carpets. Most of the carpets are only

single use because of the pressure and intensity of exploitation during the trade fairs. As a result, the company needs to handle almost 300 containers of textile wastes yearly. And this is a problem not only confined to Targi Kielce, but also to all other trade fairs and exhibition centres in Europe and across the globe. The challenge was then to identify the recycling technologies for floor coverings used by Targi Kielce so far, along with a presentation of the possibilities of obtaining and using the results of recycling by Targi Kielce or other entities in the existing or new value chains. (Kuznowicz, Gajek, Sobolewski, & Aalto, 2024.)

The hackathon resulted in a regional winner, VIVE Innovation based in Kielce. The winner's VIVE Texcellence technology utilizes up to 60 per cent of recycled textile components for the production of composite boards, structural elements and various types of fittings ideal for small architecture, garden furniture and applications in direct contact with soil or water. The concrete proposals for Targi Kielce were the exhibition stands, stages, storage shelves, fenders at parking area and small architecture (benches, flowerpots, trash bins) at resting areas outside and inside the exhibition venues – made out of their carpets, and also potentially other waste generated at the exhibitions.

As the Targi Kielce and VIVE Innovation are based in Kielce and the proposed solution responded directly to the expectations of the challenge provider, it could have been anticipated that the co-operation would proceed smoothly and in decisive steps after the first after-hackathon meeting in May 2024. In fact, the parties did swiftly start to work towards formalising their co-operation, but the momentum slowed due to the need to address regulatory barriers.

By spring 2025 the parties had ceased their joint prospective activities; however, this is where the support of the hackathon's organiser, PRO CIVIS Foundation, and the Horizon Europe program offerings, stepped in. In May 2025, the Foundation joined an international consortium working on a proposal related to the new and innovative circular business models, with the inclusion of technological demonstrators. The obvious choice for PRO CIVIS to be incorporated into this Horizon Europe venture was the potential "trade fair demonstrator", within which the used trade fair carpets would be taken by VIVE Innovation and utilized to deliver back to Targi Kielce as exhibition stands and other small architecture elements.

Finally, 14 months after the hackathon, Targi Kielce and VIVE Innovation decided to join the Horizon Europe consortium and renew their common efforts for delivering the workable and feasible circular business model for the trade fair industry. If funding is secured, the joint development project will offer the

resources, expertise and framework needed to tackle the regulatory barriers and other remaining issues of business model development. This technology demonstration would have an international relevance for the circularity mission of the global trade fair industry positioning Targi Kielce in the one of the forerunners of this sustainability movement.

Is the Co-operation ready for Take-off?

What can we conclude about these explored success cases? When is the co-operation ready for take-off? Why does the take-off sometimes take more time? Based on the 18 hackathon cases as well as the observations and reflections of the organisers, the following factors determining and supporting the launch of the co-operation after hackathon have been established:

1. The more specific and pressing the need of the challenge provider is, the greater the chance for successfully initiated co-operation.
2. The capacity of the solution provider to enter into a business or research co-operation with the challenge provider.
3. The actual business potential of the selected solution, in terms of its profitability and scalability.
4. The feasibility to implement the solution at the operations of the challenge provider. Technical capacity of the challenge provider to verify the application of the solution.
5. The availability of the development funding (from challenge provider or external sources) for building the technology and market readiness. Noting that the level of innovativeness may affect the opportunities for external funding.
6. The technology and market readiness of the solution, including established regulatory compliance.
7. The relative ease of first joint piloting activities, e.g. prototyping is typically quicker in ICT solutions compared to biomaterial treatment and processing.
8. The abilities of the parties to formalize the potential co-operation at the early stages, in particular by successfully resolving all the issues related to the intellectual property rights.

9. The potential regional support for the continuation of initiatives resulting from the BioBoosters hackathons in particular in the form of financial and / or development incentives and schemes

10. The determination of the parties to pursuit co-operation and overcome the initial barriers.

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Makings of an International Innovation Community

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In the BioBoosters piloting, an aim was set to connect 500 specialists from industry and research to tackle the challenges of the bioeconomy sectors in transitioning to the circular economy business models. This highlight ambitious goal was achieved and exceeded. The question remains can the network retain connections to this pool of alumni and how to do that?

Who are the Hackathon Alumni?

Let us start with an overview of the hackathon alumni – who are they, where do they come from and what is their background? What does the data from our participant statistics and feedback surveys tell us? The BioBoosters hackathon piloting engaged 204 organisations in different roles – challenge providers (18), solution provider teams (121), mentors (56), and organisers (9). Organisations from 16 countries joined the process – majority from the seven countries connected by the BioBoosters network, but also from other Baltic Sea Region countries, i.e., Denmark and Norway, as well as other EU countries like Belgium, and beyond, Switzerland, Ukraine, UK and Turkey. The greatest share of participants outside the network countries are solution provider teams. In addition, few mentors have been engaged in the hackathons from Denmark and France.

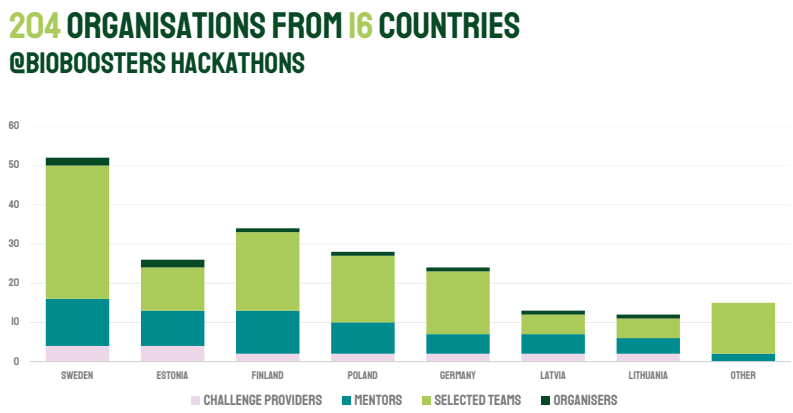

Figure 1. Hackathon alumni represent over 200 organisations

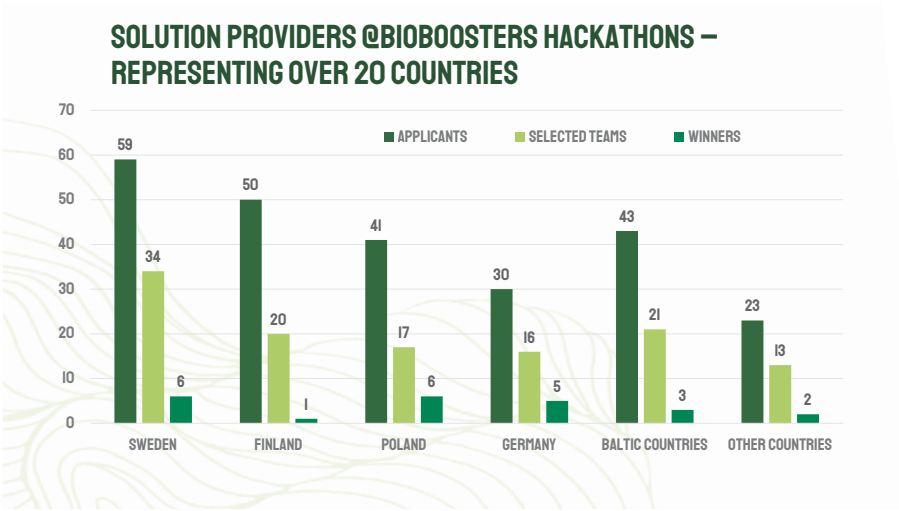

Figure 2. Country backgrounds of the solution providers in the BioBoosters Hackathons (18)

Looking at the country backgrounds of the solution providers more specifically, it must be noted that as smaller market areas, Estonia, Latvia and Lithuania are combined in the figure 2. as 'Baltic Countries'. The chart shows that jointly these smaller countries can match, or exceed, the innovation potential of large countries of the Baltic Sea Region. This highlights the importance for networks in these smaller market areas. However, it must be noted that in case of Latvia, attracting solution provider teams to the international hackathons was largely unsuccessful. This may be due to factors such as 'hackathon fatigue' in a saturated open innovation events and services 'market', or lack of readiness to enter international markets.

Alumni as Promoters and Ambassadors

In the hackathon feedback surveys, Net Promoter Score (NPS) was used to measure the satisfaction and loyalty of the hackathon alumni – the participants of the hackathons. By proposing the question 'Would you recommend the service to friend or colleague?', Net Promoter Score simultaneously captures the value of the experience to the respondent as well as the potential referral value, i.e. the word of mouth. The answering scale is from 0-10, and only the people responding 9-10 are considered promoters while people scoring the question 7-8 are considered passive and people scoring 0-6 are considered detractors. The score is calculated by a standard formula: % Promoters – % Detractors = Net promoter Score.

Net Promoter Score is considered an indicator of customer retention or loyalty – in this case, how likely the hackathon alumni (mentors, solution providers and challenge providers) are to return to another hackathon. As shown in the figure 3., the net promoter score in BioBoosters hackathons is high with a total score of 61. From the alumni, 65 per cent can be considered promoters, 31 per cent neutral and detractors 4 per cent.

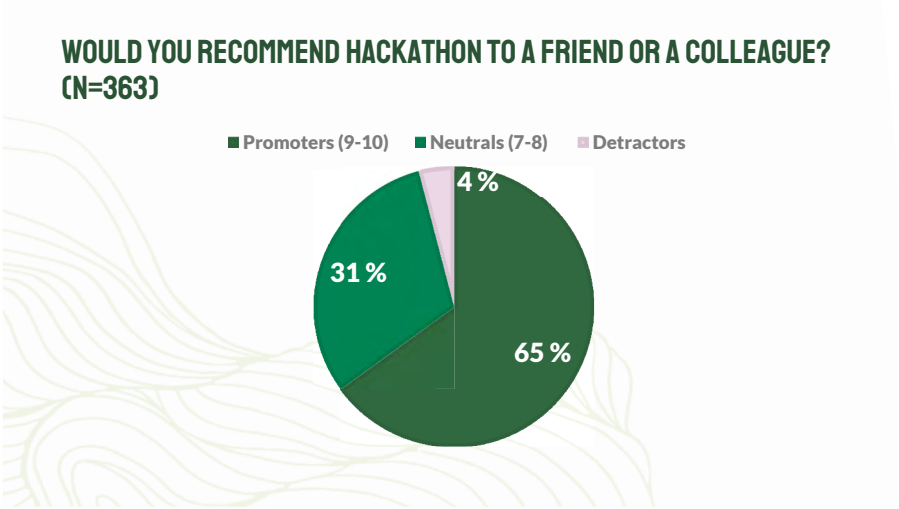

Figure 3. Net Promoter Score of Hackathon Alumni in the BioBoosters Hackathons (18)

The outcomes are supported by the responses to the direct question – would you work with us again in another hackathon in the course of the next three years. These responses from each target group are equally promising:

- 91% of challenge providers (n=44) would work with the organiser on another Hackathon challenge within the next 3 years.
- 93% of solution provider team members (n=161) would participate in another Hackathon challenge within the next 3 years.
- 96% of mentors (n=113) would participate as a mentor in another BioBoosters Hackathon with this same organiser.
- 100% of BioBoosters partner organisations plan to organise more hackathons after the project.

Apart from offering support to the communication and offering the references and testimonies of the impact of the BioBoosters hackathon, alumni are a pool of talent and expertise that can be tapped into when new challenges and open calls for innovation arise. Looking at the data of the solution provider teams in the 18 BioBoosters hackathons, 21 per cent of the applicants, 16 per cent of the selected teams and 4 per cent of the winners (Elvenite AB winner of Valio and Skellefteå Kraft Hackathons) represented alumni – in other words, teams that had been previously involved in BioBoosters hackathons.

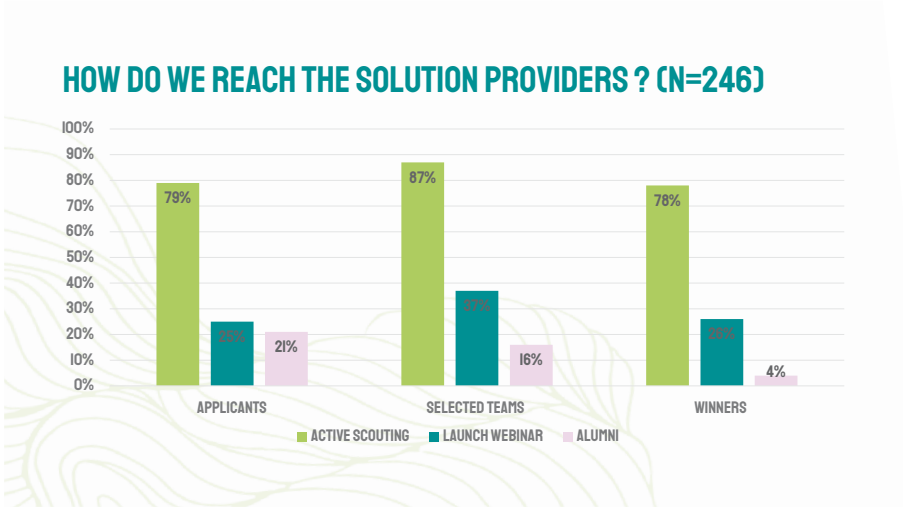

Figure 4. Share of alumni among the applicants, selected teams and winner.

Continuous Engagements relies on Consistent Activities and Shared Platforms

Alumni communication and engagement require platforms, consistent content delivery and value-adding activities and offers. Currently, BioBoosters network has 1,800+ followers in LinkedIn and a substantive mailing list for newsletters and hackathon invitations. These are the main channels the network has for communication with the alumni. In addition, the partners are staying in connection with the challenge providers, winners, solution providers with high innovation potential and mentors to support their innovation journeys, and to communicate the success stories. Thus, the main contact point is kept close to the alumni, but all partners have channels to reach the wider network of networks.

The newsletter and LinkedIn can be relatively effectively applied to reaching the alumni, since this audience is already well-informed and experienced in the hackathon process. The alumni know what to expect with a hackathon, and they are looking for more of these opportunities. If the delivery of the hackathons stays consistent, the alumni are likely to check open calls for solutions that are relevant for their expertise and field. In other words, the communication efforts reach the alumni more easily; and they are also likely to share the message with their colleagues and networks. Furthermore, LinkedIn

is operated as a community platform to connect and share the stories of the alumni. Alumni get more visibility for their expertise and innovation journeys as they are invited to share their stories with the BioBoosters community.

LinkedIn has established itself as the leading professional social media platform, playing a critical role in career development, expert discovery, and business networking. With over one billion users globally, it offers unparalleled access to professionals across industries and geographies (Marrone, 2024). For organizations and recruiters, LinkedIn is a powerful scouting tool—87% of recruiters use it to evaluate candidates, and six people are hired through the platform every minute (Clemow, 2024). Its advanced search filters allow users to identify specialists based on skills, experience, and sector, making it ideal for sourcing talent and forming strategic partnerships. Beyond recruitment, LinkedIn supports personal branding and thought leadership, enabling professionals to showcase their expertise, share insights, and engage with industry trends (Clemow, 2024). This dynamic ecosystem fosters meaningful connections and opens doors to collaboration, innovation, and new opportunities.

BioBoosters as an Innovation Community

To respond to the need for fast-paced innovations, BioBoosters network envisions a continuous connection with the alumni to develop towards an innovation community for boosting circular and sustainable bioeconomy. Innovation communities are collaborative groups that bring together diverse individuals to share ideas, resources, and knowledge, fostering creativity and driving innovation. As explored by Lim & Ong (2018), communities of innovation (CoI) play a central and pivotal role in contributing to the generation of innovations within organizations. Although often also referred to as an internal community within one organisation, e.g. university, an innovation community can bridge organisations as well as sectors. The communities can include professionals from various fields of industry and academia who collaborate to generate new ideas and solutions to complex challenges.

With the hackathon process, the BioBoosters CoI has a proven method perfectly equipped to leverage the collective creativity and expertise of their members, creating an environment where innovative thinking can thrive. The BioBoosters network with a proven open innovation process and the alumni match the characteristics set for innovation communities by Lin & Ong (2018). BioBoosters Community of Innovations is diverse and consisting of individuals from different industries and backgrounds, which enhances the exchange

of ideas and perspectives. It is also oriented on solving industry challenges and working together to develop innovative solutions. With the hackathons, BioBoosters Community of Innovations work together sharing resources and learning from one another. BioBoosters network – and the hackathons – offers a supportive environment for experimentation and learning.

Brand Alliance Boosting the Community Development

During the project, a strong brand and graphical profile has been developed and established. This has been an important marketing tool making the content cohesive and recognizable in a professional way. Due to a lot of different actors and organisers the brand has been important to bridge all the hackathons together. Having the graphical profile templates for different types of marketing, in the different phases of the hackathon, has saved time for everyone and at the same time helped organizers with less graphical experience to market their hackathons.

That all project partner has used the same brand has helped build a strong foundation for future hackathons. The professional looking profile of the brand gives a serious impression, a feeling of knowledge and that the service we are selling is legitimate and trustworthy. Taking the next step, stepping out of the project, it is important to keep using the profile and not stray too much from it. By keeping cohesive visual outlook in the marketing of BioBoosters hackathons, the established network sends unified signals to the businesses and innovators. However, going forward showing the organisational brand behind the hackathons may be a necessary way taking into account the multiplying funding sources.

Mass does Matter in an Innovation System

The overall goal is to build a foundation for a series of future hackathons that continue to generate value for both regions, countries and Europe. There are several important factors to consider when expanding the BioBoosters network with new members who may also become hackathon organisers. One of them is that BioBoosters is based on open innovation and collaboration. It is beneficial if the new member is part of a well-functioning regional innovation ecosystem, where they can access support from other actors. These actors can help identify challenge providers, solution providers, and mentors. It is also valuable to bring in new members who complement the existing network—by adding new perspectives, contacts, or sectoral expertise that current members

may not have. This could mean expanding to a new region or country, or engaging organizations from underrepresented sectors. The broader and more diverse the BioBoosters network becomes, the greater the opportunities for meaningful innovation and long-term success.

Capitalising on the Building Blocks

The long-term success of the BioBoosters network in building the open community of innovation depends on two substantive and operational components; 1) successful integration of the network activities in the partner organisations and 2) the ability to design shared network operating model that creates value for the partners – and their networks. The first outlook on integration and network visions are given in the following theme; however, to conclude, let us offer a list of critical factors that determine the potential for capitalising on the excellent building blocks for community of innovation developed in the BioBoosters project:

- Funding and resources available for the partners to consistently engage in the network activities.
- Keeping the momentum of the open calls for innovation and offers of growth and learning opportunities to solution providers and mentors.
- Transfer of the network tools and assets from the core team of BioBoosters to the wider organisation, and regional (and international) networks.

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Theme 5

Transitioning to Long-term Operations

Making the Hackathons Outlive the Project

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This article explores how the hackathon method has evolved from a project activity into a sustainable service within BioBoosters partner organisations. It reflects on why integration matters, how organisations have adapted the model to their operations, and what lessons were learned in the process. Drawing on project experiences, partners insights, and practical examples, the text outlines a pathway to make hackathons a lasting driver of innovation and collaboration across the Baltic Sea Region.

One of the central ambitions of the **BioBoosters** transnational initiative has been to accelerate the circular transition in the Baltic Sea Region by connecting established bioeconomy companies with innovative solution providers through hackathons. From the outset, the ambition was not merely to demonstrate the effectiveness of hackathons as a temporary project tool, but to create a basis for their long-term use as an **integrated method** embedded in the operational structures of partner organisations. A partner survey administrated in May 2025 reveals the progress made with this integration.

From Pilot Activities to Long-Term Capacity

The integration of the hackathon method into organisational structures marks a critical shift from project-based experimentation to sustainable service provision. The experiences of Jamk University of Applied Sciences, as analysed in Aalto (2025), show how an innovation method initially piloted within externally funded projects can evolve into a lasting capability and long-term offering. Hackathons, when embedded in core functions, strengthen institutional continuity by ensuring that open innovation does not vanish once the funding cycle ends. They enhance visibility, signal credibility, and provide organisations with a clear, recognisable service that can be offered first and foremost to businesses, but also to public and social entities looking for innovative development solutions. The method brings operational synergies, complementing existing innovation, entrepreneurship, and RDI functions

while building resilience through diversification. This is especially relevant for organisations operating in volatile funding environments, where relying on a single project pipeline is risky.

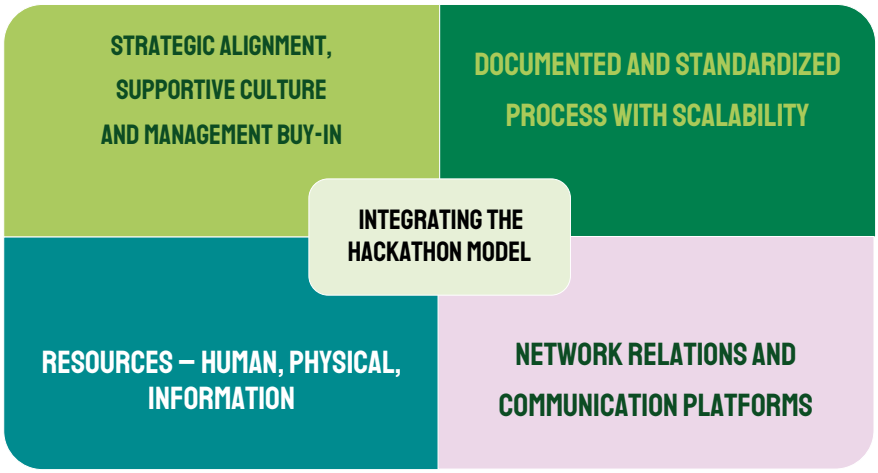

Image 1. Key aspects for successful integration.

Integration requires strategic alignment. For hackathons to become more than isolated events, they need to be anchored in the organisation's mission and strategic objectives. This anchoring must be visible in formal structures, internal planning, modes of operating and reporting mechanisms. In Jamk's case, hackathons became part of the strategic portfolio of the RDI unit, which enabled stable resourcing, formal recognition of roles, and accountability for results. Similar reflections were echoed by BioBoosters partners during the AgriVenture Day 2025 discussions. Representatives from WITENO GmbH in Germany, Pärnu County Development Centre in Estonia, and PRO CIVIS Foundation in Poland described how internal strategic commitment is decisive for whether the hackathon model remains an occasional experiment or becomes a recurring activity. In some organisations, this meant integrating hackathons into smart specialisation agendas or regional innovation service portfolios. In others, it involved creating dedicated positions or units responsible for their implementation.

Strategic Commitment: Turning Enthusiasm into Lasting Structure

Equally important is the establishment of robust processes. A common lesson from BioBoosters network entities was that hackathons cannot rely on tacit knowledge or individual expertise. When organisation of an event depends too much on a single enthusiastic champion, the process becomes fragile. To avoid this, it is essential to have documentation that describes every step of the process. This documentation allows hackathons to be replicated, scaled, and adapted over time, even if personnel changes occur.

The integration journey also requires building and distributing capacity across the organisation. Hackathons are inherently collaborative, but successful organisation depends on skilled facilitators, network managers, technical staff, and communicators. In the BioBoosters network, capacity building often took the form of staff training and peer learning during and between hackathon rounds. Partners learned to involve people from different units—RDI, entrepreneurship support, communications, and administration—to avoid dependence on a single unit. In Poland, the PRO CIVIS Foundation faced the challenge of introducing the concept to a national and regional audience more familiar with IT hackathons. They responded by broadening internal involvement and experimenting with alternative communication tools and narratives, presenting hackathons as innovation competitions to make them more accessible to Polish stakeholders. This gradual familiarisation not only increased internal capacity but also improved external communication.

An additional enabler of integration is flexibility. Hackathons are not one-size-fits-all events. One of the most significant lessons from partners' reflections is that the model must be adapted to local circumstances, resources, and strategic goals. Jamk successfully piloted shorter hackathon formats, such as innovation sprints lasting only ninety minutes, alongside full-scale events. Other partners adapted the process to different thematic areas, from biomass use and soil remediation to packaging materials and renewable energy. Some organisations have chosen to combine hackathon elements with other open innovation tools, such as accelerator programmes or living labs. This modularity is essential for integrating hackathons into existing operations rather than treating them as separate, resource-intensive initiatives.

Integrating hackathons into organisational structures also implies ensuring quality and learning over time. BioBoosters network entities repeatedly highlighted the need to evaluate each hackathon carefully, collecting feedback from participants, mentors, and challenge providers. This evaluation supports

continuous improvement and strengthens the credibility of hackathons as a service. Over time, organisations can establish their own benchmarks and internal quality assurance mechanisms, ensuring that even as the method scales up, its effectiveness remains consistent. During the AgriVenture Day 2025 panel, BioBoosters partners noted that after the first pilot rounds, their ability to collaborate improved significantly. Organisers knew what to expect from the interactions with challenge providers companies, mentors and to some degree also solution providers. Moreover, trust in the process increased, and networks became more robust.

Overcoming the Real-World Challenges of Integration

The integration process, however, is not without challenges. Many organisations struggle with internal silos and resistance to new methods. Departments may not see hackathons as part of their mandate, especially if their primary focus lies elsewhere. Institutional internal systems, including finance, human resources, marketing and communications, may not be initially designed to support open innovation processes. Some organisations reported difficulties in aligning the hackathon model with their internal administrative procedures. Funding volatility is another concern. If hackathons depend entirely on project financing, they risk being discontinued when the funding cycle ends. Aalto (2025) highlights how moving towards mixed financing models—combining project funds, service-based revenues, and internal budgets—can help secure long-term sustainability.

Another critical issue is the risk of overdependence on individual champions. Many BioBoosters partners started their hackathon journey thanks to a small group of highly motivated individuals. While these people are essential, reliance on them alone makes the activity vulnerable. Distributed responsibility, training of new personnel, and cross-unit cooperation are effective strategies to mitigate this risk. Equally important is managing growth in a controlled way. As hackathons gain popularity, the temptation to scale quickly can lead to loss of quality and staff burnout. Several partners cautioned against uncontrolled scaling and emphasised the importance of maintaining quality over quantity.

Seeing the Benefits: When Hackathons Start Driving Change

Despite these challenges, the integration of hackathons brings tangible and strategic benefits. The experience of BioBoosters partners shows that once

the method becomes part of everyday operations, it starts generating value beyond the original project context. For example, in Estonia, the hackathon model is now used to connect agricultural SMEs with researchers and international experts. In Poland, it is seen as a tool for stimulating innovative project proposals and identifying suitable partners for EU and regional development programmes. In Finland, Jamk uses hackathons as a service offered to external clients and as an integral component of its entrepreneurship and RDI activities. These examples demonstrate that integration can take different forms depending on the organisational mission, but the underlying principles remain similar: strategic anchoring, process standardisation, capacity building, flexibility, and continuous learning.

The integration of the hackathon method also strengthens the wider BioBoosters network. When partner organisations have mature hackathon capabilities, cross-regional collaboration becomes more effective. Partners can co-organise events, share mentor pools, and exchange good practices. Common branding and joint communication enhance visibility at the European level, making it easier to approach new clients and / or collaborators and funding programmes. In 2025, BioBoosters network entities discussed creating a shared knowledge base of challenges and solutions, which would allow the network to identify common themes and launch joint hackathons. There was also an idea to distribute between the BioBoosters network the individual themes of the circular bioeconomy paradigm (e.g. the cascading use of biomass, use of wastes and residues as a resource, or recycling and waste management). This would make the BioBoosters partners a kind of competence powerhouses in the given areas of circular bioeconomy and would allow for even stronger substantive collective capacity, being a very advantageous asset in the European innovation ecosystem, particularly when linked to smart specialisation strategies and Horizon Europe opportunities.

Looking ahead, integration represents more than the technical institutionalisation of a method. It reflects a broader shift in how organisations understand creating and delivering innovation and working in collaboration formats. Hackathons are not just events but a way of **working with real life challenges**, fostering openness, cross-sectoral dialogue, and practical problem-solving. To secure this legacy, BioBoosters partner organisations must continue aligning hackathons with their strategic missions, explore the market demands, investing in people and knowledge, and maintain the balance between flexibility and consistency. The BioBoosters network provides a fertile ground for shared learning and mutual support, ensuring that hackathons remain a living practice rather than a completed project activity.

In conclusion, embedding the hackathon method in BioBoosters partner organisations is both a strategic necessity and an opportunity. It allows partners to extend the impact of the BioBoosters project, enhance their own service portfolios, and contribute to the circular bioeconomy transition of the businesses and the given regions in a sustainable way. Integration requires strategic decisions, deliberate actions, structured processes, and continuous investment, but the returns are considerable: stronger organisations with more interesting market offerings, more resilient networks, and a shared capability to address complex challenges collaboratively. What began as a pilot activity is now evolving into a lasting innovation service, shaping how regional development, research, and entrepreneurship intersect across the Baltic Sea Region.

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BioBoosters Network striving for Long-term Collaboration towards Circular Bioeconomy

Katrin Kepp, Estonian University of Life Sciences, Estonia

The BioBoosters Network, outcome of the BioBoosters project co-funded by the Interreg Baltic Sea Region (BSR) Programme, has emerged as a transformative force in advancing circular bioeconomy (CBE) innovation across Northern Europe. As the project phase concludes, the network is transitioning toward long-term viability, institutional integration, and strategic scaling, ensuring continued impact across Europe.

This article synthesizes academic insights, field-based learnings, and strategic planning documents to outline the network's long-term operational model and vision. It emphasizes the viability of the BioBoosters approach, its integration into regional ecosystems, and its alignment with sustainability goals. Drawing on success stories, the article presents a roadmap for sustaining and scaling circular bioeconomy transitions through modular innovation formats, public-private partnerships, and interdisciplinary mentorship.

The circular bioeconomy integrates the sustainable use of biological resources with circular economy principles to support climate-neutral and resilient societies. It promotes regenerative value chains, reduces waste, and enhances resource efficiency. While strategic frameworks exist, effective implementation depends on agile innovation tools, multi-actor collaboration, and systemic support.

The BioBoosters Network brings together partners from Estonia, Finland, Latvia, Lithuania, Poland, Sweden, and Germany. Using a challenge-driven hackathon model, it connects universities, SMEs, public agencies, and innovation hubs to co-create solutions responding to circular bioeconomy challenges. With 18 hackathons, over 120 validated solutions, and 23 RDI (research, development and innovation) partnerships, BioBoosters has demonstrated its impact across sectors, from biomass valorisation and soil remediation to sustainable packaging and digital maintenance systems. (BioBoosters, 2023.) The Baltic Sea Region's strong innovation culture, rural development potential, and alignment with EU strategies and programmes, such as the European Green Deal, Horizon Europe, the EU Bioeconomy

Strategy, the Circular Economy Action Plan, and the Clean Industrial Deal, make it a well predestined region for scaling circular bioeconomy innovation.

Modular and Scalable Innovation Format as a Strategic Foundation

The BioBoosters hackathon model (figure 1) is built to be **agile, modular, and scalable**, making it adaptable to a wide range of innovation contexts and stakeholder needs. The format is agile as it can be tailored to different durations, from short sprints (one day) to multi-day events and can accommodate various challenge types, including technical, environmental, and business-oriented problems. The hackathon process is also built modular and customizable for different target groups. It serves SMEs seeking rapid prototyping, large enterprises exploring strategic innovation, and research institutions aiming for applied collaboration. The process includes modules such as stakeholder engagement (launch, kick-off), mentoring, hackathon days, pitch coaching, and post-event integration, typically delivered over a 10-week period. Finally, the model is scalable as it is replicable across regions and sectors, allowing for cross-border collaboration and thematic specialization. It has been successfully applied in domains such as biomass valorisation, soil remediation, sustainable packaging, and digital maintenance systems.

The outlined flexibility ensures that BioBoosters hackathons are not one-size-fits-all events but dynamic platforms that can evolve with the needs of participants and challenge providers. It also supports the network's ambition to expand its reach across the Baltic Sea Region and beyond, fostering innovation ecosystems that are both locally grounded and globally connected.

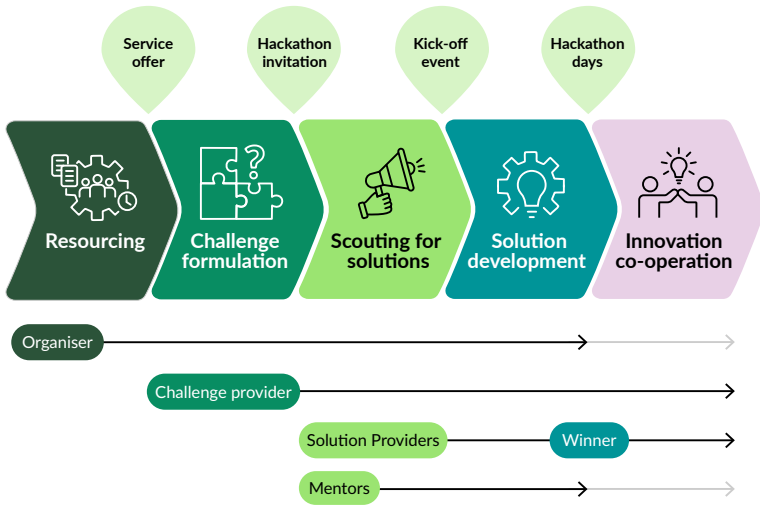

Figure 1. Hackathon process. (BioBoosters)

BioBoosters Network-as-a-Service Concept

Anchored in the quintuple helix innovation model (Carayannis, Barth, & Campbell, 2012), the BioBoosters long-term strategy positions the initiative as a Network-as-a-Service (NaaS) provider. Network that is an orchestrator of collaborative innovation across academia, industry, government, civil society, and the natural environment. Through structured services such as hackathon facilitation, challenge brokerage, and expert matchmaking, BioBoosters enables systemic knowledge flows and co-creation processes that transcend institutional silos. This service-based architecture not only supports dynamic problem-solving and regional innovation capacity but also ensures financial sustainability through service contracts, public innovation funding, and strategic sponsorships. The NaaS model thus transforms BioBoosters into a resilient, mission-driven innovation infrastructure not in the physical sense, but as a structured, service-based system that enables collaboration, knowledge exchange, and sustainable value creation across sectors.

Establishing Integrated Communication and Alumni Platforms

To ensure continuity and sustained engagement within the BioBoosters innovation ecosystem, a unified communication system will be implemented, integrating a shared Customer Relationship Management (CRM) platform, strategic branding, and impact-driven storytelling. CRM systems have been shown to enhance both exploitative and exploratory innovation by enabling structured stakeholder management and personalized engagement (Gil-Gomez, Guerola-Navarro, Oltra-Badenes, & Lozano-Quilis, 2020). Complementing this, narrative-based branding strategies foster emotional connection and community identity, which are critical for innovation diffusion and stakeholder retention. Central to the system is alumni tracking and ambassador engagement, which transforms past participants into active contributors—mentors, advocates, and co-creators. Empirical evidence confirms that alumni networks significantly enhance exploratory innovation and long-term sustainability by facilitating trust-based knowledge exchange (Song, Guo, & Shen, 2023). Together, these components form a relational infrastructure that reinforces BioBoosters' role as a resilient and evolving innovation community.

Responding to the Needs for Business models and Technological Integration

In the context of the BioBoosters long-term model and viability, seven circular bioeconomy business model archetypes form a strategic foundation for sustainable innovation; these are:

- Optimizing resource efficiency.
- Establishing and upgrading biorefineries.
- Value recovery from side streams and waste.
- Resource exchange.
- Discovery of bio- and renewable resources.
- Valuing the local economy.
- Service- and result-oriented value offers.

Among these, value recovery from waste and innovation toward renewable resources are particularly impactful, as they align with key sustainability goals and are frequently adopted in practice (Salvador, & De Francisco, 2025;

Dorrego-Viera, Urbinati, Hansen, & Lazzarotti, 2024). These archetypes support BioBoosters ventures by reducing environmental footprints, enhancing resource circularity, and enabling diversified revenue streams. For example, the B2Circle framework identifies and validates these archetypes through a structured methodology, offering tools for businesses to assess and transition toward circular models (Salvador & De Francisco, 2025). Similarly, open innovation models in forest-based bioeconomy sectors demonstrate how renewable resource innovation and waste valorisation are central to sustainable business strategies (Dorrego-Viera, Urbinati, Hansen, & Lazzarotti, 2024). By integrating these models into the BioBoosters hackathon process, the initiative fosters technological advancement, policy alignment, and systemic transformation toward a resilient circular bioeconomy.

Mentorship as one of the Cornerstones of BioBoosters Hackathon Success

Mentorship is a strategic pillar in the BioBoosters hackathon model, directly contributing to its success and long-term viability. Unlike conventional innovation events, BioBoosters embeds mentorship as a structured, iterative, and impact-driven process, where experts from academia, industry, and policy guide teams through real-world bioeconomy challenges. This mentoring approach fosters systems thinking, accelerates the translation of scientific insights into practical applications, and supports the development of commercially viable solutions. Internal evaluations from BioBoosters show that 95 per cent of solution providers gained know-how from mentoring, and 94 per cent agreed that mentoring helped build partnerships for idea testing and commercialization (BioBoosters, 2023).

Many hackathons, such as those co-organized with Fibenol and Nordic Hemp, exemplify transformative challenge design, where challenges are framed around sector-wide ambitions rather than narrow technical problems. This approach encourages visionary thinking, attracts interdisciplinary participants, and fosters deep ecosystem engagement. In this context, mentors act not just as advisors but as co-creators, supporting teams beyond the event through pilot projects, joint research, and long-term partnerships (BioBoosters, 2023).

Moreover, mentorship in BioBoosters serves as a learning enabler, scaffolding participants through ambiguity, supporting design thinking and prototyping, and encouraging reflection and iteration. This aligns also with the E-Mentoring framework, which emphasizes the cultivation of mentoring ecosystems that support innovation, inclusion, and institutional alignment

(Montgomery, Mondisa, & Wai-Ling Packard, 2024). Additionally, transformative learning combined with design thinking has been shown to foster sustainability mindsets and changemaker competencies in innovation education (Macagno, Nguyen-Quoc, & Jarvis, 2024).

By integrating mentorship into every phase of the hackathon, from solution development to post-event collaboration, BioBoosters model ensures that promising ideas are not only developed but also nurtured toward implementation. This makes mentorship a key driver of systemic impact, enabling the circular bioeconomy transition through knowledge transfer, innovation support, and ecosystem building.

Viability and Sustainability of the BioBoosters Network

The long-term viability of the BioBoosters network is underpinned by a combination of demonstrated impact, institutional integration, and strategic alignment with European sustainability and innovation frameworks. According to the participant feedback surveys administrated in the 18 hackathons, 96 per cent of participants are expressing willingness to engage again; hence, the model shows strong stakeholder satisfaction and trust, which is essential for sustained ecosystem development. The network's integration into universities, development centres, and SMEs ensures continuity, knowledge transfer, and access to infrastructure and talent, reinforcing its role as a regional innovation catalyst.

Strategically, BioBoosters aligns with EU sustainability goals, including the European Green Deal, Circular Economy Action Plan, and Smart Specialisation Strategies, positioning itself as a platform for mission-driven innovation. Its capacity to evolve into a legal entity or cooperative offers a pathway for formalized governance, resource pooling, and cross-sector coordination as key elements for scaling and resilience in the innovation ecosystems. The network also supports transformative interventions in the circular bioeconomy, such as:

- Advanced recycling technologies that enable material recovery and reduce dependency on virgin resources.
- Eco-design for disassembly and recyclability, promoting product lifecycle thinking and circularity.
- Stakeholder collaboration for material recirculation, fostering industrial symbiosis and regional value chains.

These interventions reflect the principles of systemic innovation and co-designed transformation, as emphasized in circular bioeconomy literature; Bauer, Hansen & Hellsmark (2018) on biorefinery innovation networks; Mac Clay & Sellare (2025) on value chains and social sustainability in bioeconomy upgrading; and Schagen et al. (2025) on co-designed interventions for circular initiatives. Together, these elements position BioBoosters as a scalable, resilient, and policy-aligned innovation network, capable of driving regional transformation toward a sustainable circular bioeconomy.

Strategic Vision for 2035 and Beyond

Looking ahead to 2035, the BioBoosters network model envisions its transformation into a pan-European innovation infrastructure that connects regional ecosystems through a federated, challenge-driven model, enabling continuous co-creation across borders, sectors, and disciplines. This evolution will integrate emerging scientific and technological advancements—such as synthetic biology for bio-based materials (Asemoloye et al., 2023), AI-driven bioinformatics for optimizing microbial processes and resource flows (Shah, Wever, & Espig, 2025), digital twins for simulating circular systems and interventions (Preut, Kopka, & Clausen, 2021), and carbon-negative bioproducts that restore ecosystems and reduce emissions (Dees, Sagues, Woods, Goldstein, Simon, & Sanchez, 2023)—into hackathon formats and pilot programs, accelerating circular transitions in both industrial and rural contexts.

The network could expand its reach globally, forming strategic alliances with bioeconomy hubs in North America, Asia, and Africa, while contributing to international standards and aligning with global sustainability frameworks, including the UN Sustainable Development Goals and EU missions on soil health, climate adaptation, and circularity.

BioBoosters will also cultivate a new generation of bioeconomy changemakers like scientists, entrepreneurs, and policymakers equipped with systems thinking, sustainability mindsets, and collaborative competencies—through alumni networks, mentorship ecosystems, and open science platforms, evolving into a knowledge common for circular innovation. Institutionally, the network will operate as a multi-stakeholder cooperative governed by a rotating council of universities, SMEs, public agencies, and civil society actors, ensuring democratic decision-making, resource pooling, and strategic coordination to reinforce resilience and scalability (Wang, Xie, & Gen, 2024).

Building on practical insights from recent hackathons, BioBoosters help explore decentralized biomass processing models and digital tools that

address logistical bottlenecks. Inspired by events like the Piesta Hackathon, the network stands to promote mobile biorefinery concepts, hybrid participation formats, and transnational mentoring ecosystems. These elements enhance accessibility, visibility, and continuity for SMEs, ensuring that local challenges can evolve into scalable, policy-aligned innovations.

Risks and Dependencies in Achieving the Future Vision

While the strategic vision for 2035 is ambitious and well-aligned with global sustainability frameworks, its realization depends on several critical factors.

- **First**, sustained funding from public and private sources is essential to support hackathon operations, mentorship ecosystems, and technological integration.
- **Second**, policy continuity and regulatory support across EU member states will be necessary to maintain alignment with circular economy goals and innovation mandates.
- **Third,** stakeholder engagement must remain high, with active participation from SMEs, universities, and civil society to ensure co-creation and knowledge exchange.
- **Fourth,** technological readiness and interoperability across regions may pose challenges, especially in deploying advanced tools like digital twins and AI-driven bioinformatics.

Addressing these dependencies through proactive governance, adaptive planning, and inclusive stakeholder strategies will be key to ensuring the resilience and scalability of the BioBoosters network model. To further ensure clarity and accountability, the long-term model could be governed by a designated lead institution or cooperative entity within the BioBoosters network. However, its implementation may face limitations due to varying levels of innovation readiness, cultural expectations, and institutional capacity across partner countries. These differences must be addressed through adaptive governance and localized support mechanisms to enable equitable and effective scaling.

A Network Built to Last

A viable long-term operational model for circular bioeconomy innovation must integrate diverse business models, leverage technological advancements, and

foster collaborative frameworks. The BioBoosters Network exemplifies this approach—combining stakeholder-driven innovation, institutional integration, and strategic alignment with EU sustainability goals to create a replicable and scalable model for Europe's transition to a circular bioeconomy. Its success is evidenced by high stakeholder satisfaction (96% willing to participate again), deep ecosystem engagement, and the capacity to evolve into a formal legal entity or cooperative for strategic coordination. What sets BioBoosters apart is its ability to integrate hackathons into innovation ecosystems, where mentorship, challenge design, and systemic thinking converge to solve complex problems collaboratively. Strategic interventions such as advanced recycling technologies, eco-design for disassembly, and stakeholder collaboration for material recirculation, ensure that the network remains future-proof and policy-aligned. As BioBoosters enters its next phase, it invites new partners to co-create the future of circular bioeconomy innovation.

As echoed by its community during an open panel discussion held on May 27, 2025, as a part of a BioBoosters study visit to AgriVenture Finland 2025:

> *We are all connectors. Our role is to bring together researchers and companies across borders.*
> *– Svea Uusen, Pärnu County Development Center.*

> *Everyone wants to stay involved and be equal partners.*
> *– Katrin Kepp, Estonian University of Life Sciences.*

> *We have a process that can solve even complex problems so that everyone involved is satisfied.*
> *– Eva Fridman, BioFuel Region.*

> *More people, more impact. Let's stay together.*
> *– Lina Stanionytė, Sunrise Tech Park.*

BioBoosters is not just a project – it is a movement. A network built to evolve.

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Closing Words: Takeaways from Change-making Open Innovation Journey

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What are the most important guiding principles for organising an impactful open innovation process to meet the needs of the challenge provider, solution providers and mentors? BioBoosters have consolidated the collective hackathon wisdom to a handbook for the hackathon organiser and communicator. From delivering the promised results to maximising the value of everyone's time, BioBoosters team is sharing the practical guidance for new organisers – and is open for co-operation for boosting innovation in rural bioeconomy sectors for competitiveness and sustainability.

After a lot of discussion on the hackathon experience and impact maybe you are keen to know how to organise the hackathon in practise? You are in luck! The 18 joyrides of innovation have all been unique learning processes with their own specific lessons learned. The outcomes have been analysed jointly by the international organisers' team to provide practical guidelines, checklists, and instructions for organizing an impact-making hackathon that delivers the promised value to all target groups. From the collection of lessons learned featured in the handbook, there are key insights that summarise all individual tips and tricks of the organiser. These principles are applicable to development and implementation of open innovation processes anywhere.

Let us conclude the 'insights of the BioBoosters' with takeaways on change-making open innovation summarising the main messages of the 'How to be a BioBooster! Hackathon Handbook'.

Keep in Mind the Bottomline – Concrete Co-operation

All BioBoosters hackathons offer the teams a chance to launch a co-operation with the challenge provider. A plausible, concrete co-operation offer is the premise for building the whole process and for engaging the participants. Whether it is defining the target groups or setting the evaluation criteria, make sure the choices support establishing a business-driven RDI co-operation or business partnership responding to the need of the challenge provider.

BioBoosters hackathon process is flexible and responsive to arising needs. As always when there are multiple organisations and people involved – changes happen. With the experience of over 30 hackathons, our process is well tested – and we also know how to respond to the arising needs. We know the success factors to prioritise – and we know that an impactful outcome can result from a variety of approaches. **When the need to adapt arises, focus on the bottom-line. It will help you to prioritise.**

Your Job is to Maximise the Value of Everyone's Time

Time is the most valuable resource that all the participants of the hackathon are committing to the process. To make most of this valuable resource, we encourage the organiser to use the time for what matters and to be clear about the expectations to all participants.

Be clear about the expectations It is important to communicate how much time the challenge provider, teams, and mentors are expected to commit to the process to help them make an informed decision. Make sure the challenge provider will understand the effects of process adjustments to the work time input (e.g. what are the effects if a challenge provider hopes to tackle two challenges instead of one or they wish to organise the hackathon days at their venue). Communicate what is the minimum requirement for use of time; and also, what is the added value if you are using more time, etc. by joining onsite. Creative co-learning is inherently a voluntary activity building on inner motivation. The process can be inspired and guided, but it cannot be forced. If a person or an organisation is unable to give the hackathon process the necessary attention and focus, this will be reflected negatively on the results.

Using the time for what matters. As an organiser, it is important to give the participants a chance to focus their time on the challenge and the solutions – your job is to take care of all the rest. Make sure participants can easily access all the information they may need. Allow them to trust your guidance through the process. BioBoosters network is returning you the favour by offering the ready set of organisers' tools, communication channels and templates so that you can focus your time on managing the process and guiding the participants.

Remember to be also compassionate to yourself and your team since time will always be a limiting factor and all fun ideas might not be feasible to implement. Prioritise the tasks that create the greatest value – the process must move forward, and we must work within the resources available, especially the time resource that we have.

Learning (and impact) Happens via Dialogue

Dialogue is essential for the whole process, and it requires facilitation both online and onsite. Enable multilateral dialogue between challenge provider and teams, challenge provider and mentors as well as of course teams and mentors. Facilitate the dialogue by helping to break the ice, allowing the participants to get to know each other and interact also in a more informal way. Make sure the teams know the expertise of the mentors before the mentoring sessions. Make sure the jury gets the feedback and conclusions of the mentors to support their decision making. Allow the teams to get to know each other to explore co-operation possibilities.

Regardless of the outcome of the hackathon, all participants are happy of their involvement if they come out with a new valued contacts.

Great Innovation (process) is Scalable

The hackathon process is ready for use. From service agreements, rules of participation to digital platforms for hybrid co-working, all is set. However, each hackathon is still unique, and organiser should be well-prepared for the managing the process effectively despite the surprises on the way.

This is why:

- Available resources vary (e.g. ability to compensate team travelling, evening program, co-organisers)
- Challenge definition will determine the direction of the co-learning and innovation journey (e.g. target groups, aims, evaluation criteria, international scope)
- Selected teams will determine the scope of solution ideas explored (e.g. technology readiness, needed mentoring expertise)
- Participants choice of online or onsite participation will determine the approach for networking and interaction on the hackathon days.

BioBoosters hackathon process can be scaled to match the available resources. By collaborating with the challenge provider, sectoral agencies or interest groups as well as making use of the online platforms, you can make the hackathon process work with a limited budget. When resources are available, you can scale-up the process by engaging (international) partners as co-organisers to boost your active scouting as well as provide added value for all participants by supporting onsite participation and by offering

networking activities that support informal interaction. Onsite participation usually makes the most memorable moments; however, online hackathon can be just as effective for achieving the bottom-line.

Wrap-up: Rural Development Calls for Networks

The hackathon wisdom of the BioBoosters network is now collected to guidelines and conclusions, but the development work will continue on organisational level and in the network. The bottom-line of the network co-operation is the aim to launch business-driven RDI partnerships to respond to the challenges of sustainability and competitiveness in the bioeconomy sectors of the connected regions. As rural regions, the sphere of actors in the innovation ecosystems is inherently small; and thus, we need friends to boost the innovation process and renewal of the business operations. Networks are essential for rural business development to find solutions and partners. As the BioBoosters network is continuing to work together to find solutions and find the right professionals and connections for the rural bioeconomy companies, it is now equipped with a powerful tool, a proven method for inter-regional open innovation. The process know-how will be applicable to many types of shared challenges and development needs. Via adaptations and continuous process development, the network can benefit from various opportunities to boost their regional development.

The need for resilient and sustainable bioeconomy development in the rural areas is only increasing in importance. With a network of networks, impressive track-record and workable methodology to respond to this need, BioBoosters has a strong outlook for the future.

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This publication offers an overview of the lessons learned during intense, international, and iterative two-year piloting of an open innovation process that connected nine regions and their networks across the Baltic Sea Region. With a target to boost circular transition and equipped with the proven hackathon model designed in Jamk University of Applied Sciences, the BioBoosters partners have worked together to solve 18 challenges of bioeconomy companies looking to transform their business models and operations with the help of new solutions and partners. Get inspired by the lessons learned in the project that has sparked co-operation and boosted innovation beyond borders and expectations.

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