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A METHODOLOGICAL FRAMEWORK FOR CO-CREATION OF GOVERNMENT-RESEARCH-INDUSTRY INNOVATION

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Abstract. Government, industry, and research collaboration is important. Governments are developing instruments for stimulating innovation within small and medium-sized enterprises (SMEs). Researchers are expected to focus on solving economic, environmental, and social problems. Enterprises need new solutions to survive in global markets. Traditionally, co-creation is a tool for collaborating between researchers and industry during the innovation development process. In this study, a methodological framework for government-research-industry co-creation in the pre-competitive innovation phase was developed and tested. It was piloted with a group of six researchers and nine enterprises from Latvia co-creating solutions for sustainable food packaging. The experiment was a targeted intervention by a public administration body to facilitate industry-research collaboration, thus strengthening SMEs competitiveness. The study demonstrated that the developed methodological framework is a useful tool for professionals involved in the day-to-day facilitation of collaboration between researchers and businesses, such as business support and development professionals and innovation project managers. It is appropriate for laying the groundwork for more in-depth industrial research or experimental development between researchers and businesses. Professional moderation is critical in the co-creation process, and it is more enriching if the pool of participating enterprises consists of SMEs and larger enterprises covering the value chain of the explored topic. The bridging co-creation phase is appropriate for an online environment, whereas the experimental co-creation phase would benefit more from taking place in a physical setting. To achieve better results, it is important to choose narrower and more clearly defined problems. The co-creation process aids in the development of collaborative communication skills, the generation of ideas in a diverse group, and overall digital literacy.

Keywords: *co-creation, government-research-industry collaboration, open innovation, small and medium-sized enterprises, smart specialization.*

JEL Classification: O31, O32, O36

INTRODUCTION

Collaboration between government, research, and industry is becoming increasingly important in today's world. Governments are concentrating their efforts on developing various support instruments to stimulate innovation within small and medium-sized enterprises (Bertello, Ferraris, De Bernardi, & Bertoldi, 2022). Researchers are expected to conduct more applied or practically oriented research aimed at solving problems important to the economy, environment, and society (Bruneel, D'Este, & Salter, 2010). In turn, businesses require new solutions and

innovations to gain a competitive advantage and thrive in global markets with increasing competition. In the process of innovation development, co-creation is one of the tools for research-industry collaboration (Haataja, Hautamäki, Holm, Pulkkinen, & Suni, 2018).

The purpose of this study is to propose and test a methodological framework for government-research-industry collaboration in the pre-competitive stage of innovation process. The framework was developed and piloted in a period from June to December 2020 with a group of six researchers and nine enterprises from Latvia co-creating innovative solutions for sustainable food packaging.

The experiment named "Innovation Co-creation Laboratory" was implemented as a targeted intervention of Vidzeme Planning Region, a public administration body, in order to encourage small and medium-sized enterprises (SMEs) operating in a smart specialization area to open innovations and to collaborate with researchers. Because this experiment was carried out in accordance with the Covid-19 social distancing regulations, the piloting of innovation co-creation methodological framework was completely adapted to the online environment. The term "innovation co-creation" is increasingly appearing in documents at various levels, such as policy frameworks, project calls, and action plans developed as part of international projects. However, stakeholders in Latvia are only now becoming acquainted with it. Until this research study, there were no described prerequisites, methods, or practical advice on how co-creation would be organized by public sector organizations, which play a mediating role in promoting industrial and scientific cooperation.

1. LITERATURE REVIEW

Smart Specialization is a strategic, place-based approach to economic development. It enables countries and regions to identify and develop their own competitive advantages, and to generate knowledge-driven growth by building on the available assets and resources and on their specific socio-economic challenges (EC, 2022). The fundamental tenet of the smart specialization approach is that policy resources should be prioritized on those initiatives, technologies, or industries where a region has the greatest likelihood of producing far-reaching effects that also create and build upon a variety of local and regional linkages and connections (Foray et al., 2012). Additionally, the smart specialization strategy places entrepreneurship and SMEs at the forefront of EU development policy consideration (McCann, Ortega-Argilés, 2016) due to their effects on wealth creation, innovation, skills, and capabilities, the opening of new markets, job creation and job satisfaction (EC, 2012). However, one of the barriers to the growth of SMEs in smart specialization is the lack of collaboration with research institutions at both the national and international levels, as well as the low absorption of research-based solutions. That leads to the fact that SMEs, especially those operating in less developed and sparsely populated regions with no presence of strong knowledge centres and networks, lack knowledge about the latest scientific discoveries and developments, and opportunities to use them for the needs of their industry and the development of innovation (Vidzeme Planning Region, 2019), therefore, government intervention becomes necessary.

Co-creation is one of the tools to reduce the gap between industry and science, and it is especially suitable in the pre-competitive innovation phase (Haataja et al., 2018). The pre-competitive innovation projects are a category of inter-organizational projects which are usually carried out in the exploration phase of research and development. In such

projects, SMEs tend to collaborate with researchers to develop basic research or research and experimental development (Bertello, Ferraris, De Bernardi, & Bertoldi, 2021). Co-creation is defined as collaborative problem solving that combines customer and supplier resources in an interactive process with the aim of producing the best value possible. As depicted in figure 1, customers provide resources like information, business intelligence, and tools, whereas suppliers apply their specialized professional competence and judgment (Aarikka-Stenroos & Jaakkola, 2012).

In the context of cooperation between universities, research institutions and companies, scientists and researchers are considered as suppliers, and companies - as customers. Entrepreneurs and scientists from various scientific disciplines work together to define and resolve problems that are crucial to the industry during the co-creation process. The knowledge and skills of researchers are combined and merged with the business expertise of entrepreneurs to create the new value, which is developments for new products, services, processes, or technologies, etc.

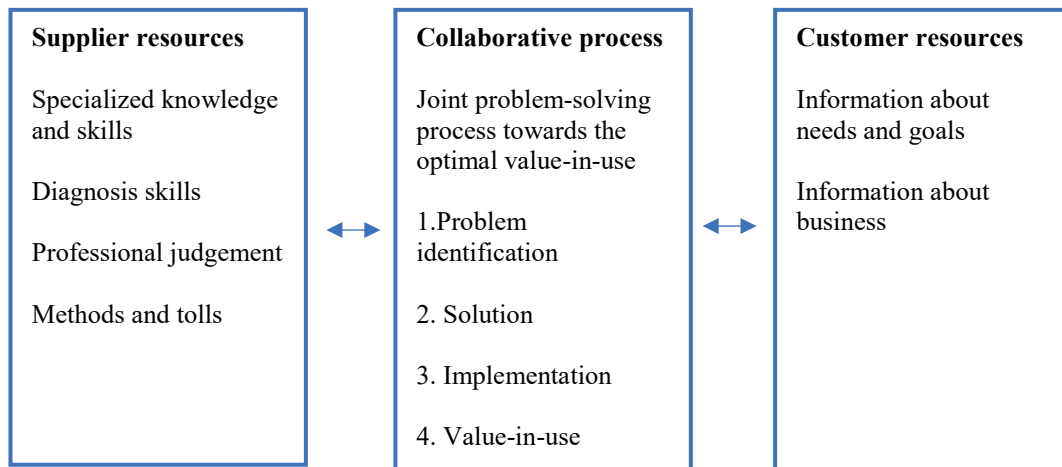


Fig. 1. Framework for value co-creation as a joint problem-solving process
(Adopted from Aarikka-Stenroos & Jaakkola, 2012).

Figure 2 is a schematic representation of the co-creation-based university-company interaction model. The dialogue in co-creation platforms or premises, in which both researchers and companies participate equally, is at the heart of the figure. Universities' operations are founded on research and teaching, which lay the groundwork for co-creation. Companies require new ideas and are constantly under pressure to reinvent themselves. In co-creation, know-how is shared in sessions where people from various backgrounds come together. Everyone is in the process of learning and understanding (Haataja et al., 2018).

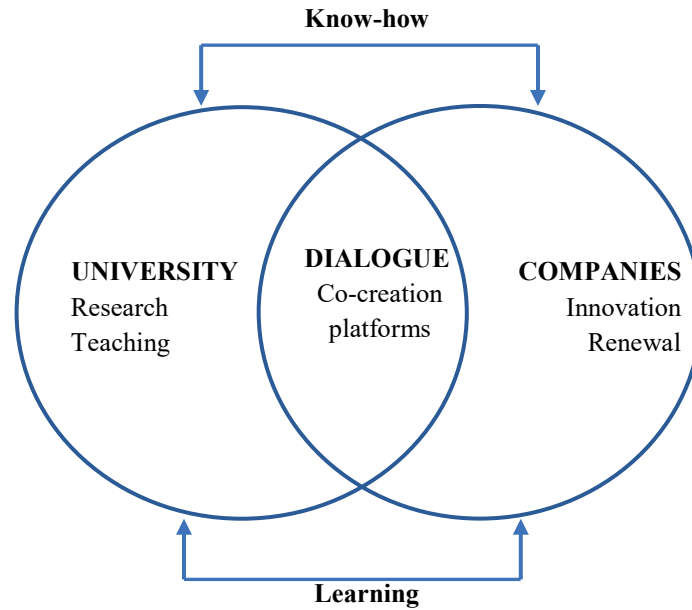


Fig. 2. University – company interaction model (Adopted from Haataja et al., 2018).

When talking about university – industry co-creation, Haataja, et.al (2018) differentiate three co-creation forms – *bridging co-creation*, *experimental co-creation*, and *co-research*. The bridging co-creation aims to create collaborative connections between researchers and companies to produce solution proposals for problems that have been identified in cooperation. Experimental co-creation or co-development focuses on finding solutions to the company’s problems by carrying out practical experiments and testing assumptions. Co-research is usually conducted by the university and the enterprise together with a purpose to create new knowledge. Figure 3 demonstrates that the co-creation process begins by defining the problems and then moves on to solving them. At the end, the results are analysed, and the solutions are tested in practice. This may result in new practices, services, and products for the company. While for the researcher, it is critical to evaluate the results from a scientific standpoint. Throughout the process, researchers and companies communicate with one another. Later on, it may be necessary to revisit earlier stages, for example, to elaborate on the research question or test the solution before launching it (Haataja et al., 2018).

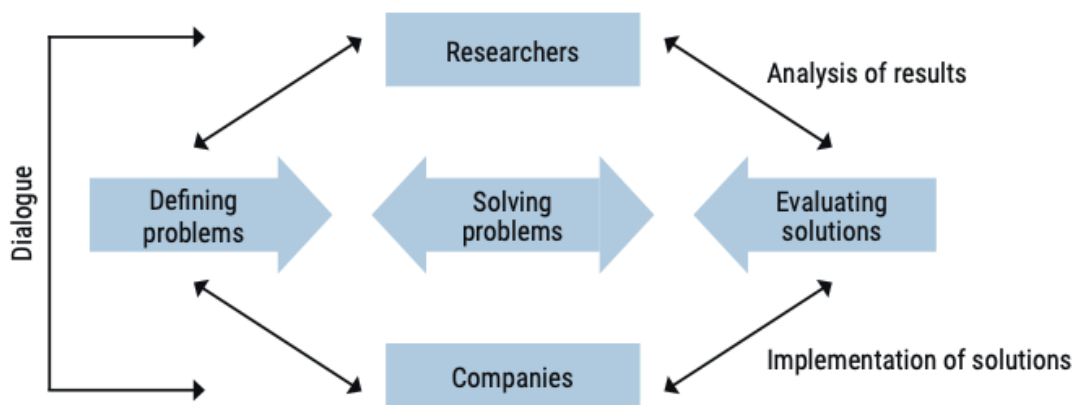


Fig. 3. Co-creation process (Adopted from Haataja et al., 2018).

The government initiated and supported co-creation can be beneficial to SMEs, especially to smaller and more traditional enterprises operating outside of knowledge centres and more remote regions, who often lack time and resources to engage in open innovation practices (Bertello, Ferraris, De Bernardi, & Bertoldi, 2021), and find it challenging to reach out to research institutions and universities due to the lack of knowledge.

2. METHODOLOGY

Although there is not a single, widely accepted definition of the term “methodological frameworks” in the scholarly community, McMeekin, Wu, Germeni et al. (2020) define it as “a structured guide to completing a process or procedure” based on their scoping review of how methodological frameworks are being developed. The results of this study show that methodological frameworks are most frequently created using already established methods and guidelines (McMeekin, Wu, Germeni et al., 2020). The same applies to this research study.

The methodological framework for government-research-industry innovation was created on the basis of the classification and stages of the co-creation process between universities and companies described by Haataja et al. (2018) as a seven-phase process with a set of tasks in each phase (see Fig. 4).

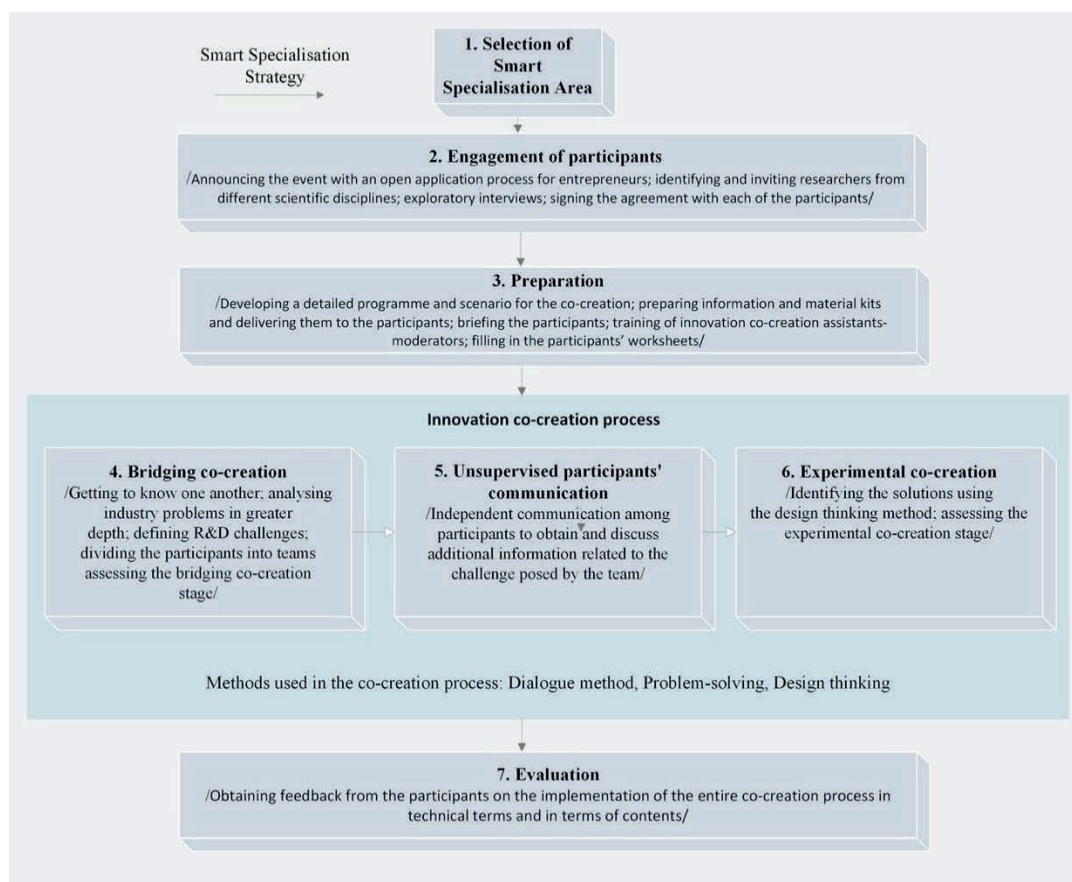


Fig. 4. Methodological Framework for Co-creation of Government-Research-Industry Innovation.

The methodological framework includes: 1. Selection of Smart Specialisation Area; 2. Engagement of participants; 3. Preparation; 4. Bridging co-creation; 5. Unsupervised participants' communication; 6. Experimental co-creation, and 7. Evaluation. The framework also includes methods of a dialogue, a problem-solving, and design-thinking and a number of group-work techniques. It was developed and tested as a part of experimental event named "Innovation Co-creation Laboratory". Unlike Haataja et al. co-creation process, the co-creation in this research study was implemented by three parties: the government, the research, and the industry. Figure 5 represents the government-research-industry interaction model applied. The government was represented by Vidzeme Planning Region (VPR), a public administration body responsible for the coordination of regional development, including economic development, and spatial planning in the Vidzeme region in Latvia. VPR was the co-creation process initiator and charged for selecting the regional smart specialisation area in the frame of which the co-creation took place, the engagement of participants (SMEs, researchers, experts, and co-creation process moderators), and overall co-creation process coordination and moderation, and evaluation.

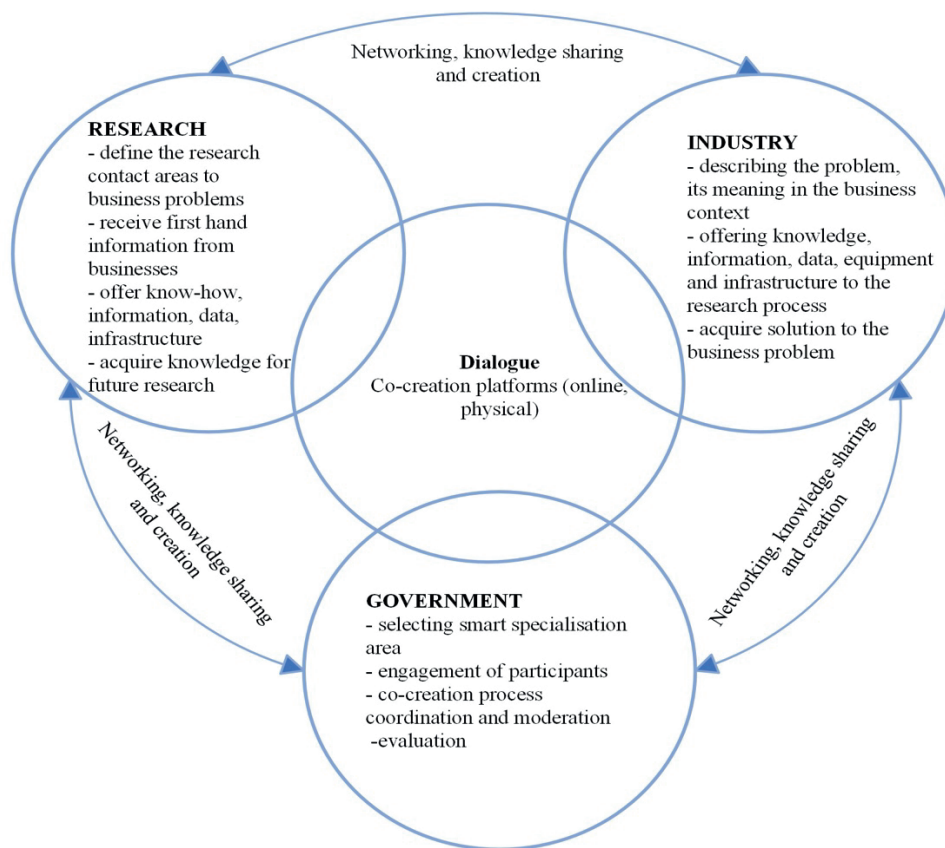


Fig. 5. Government – Research – Industry interaction model in the co-creation process.

The methodological framework was tested with a group of six researchers representing scientific disciplines relevant for sustainable food packaging, such as material science, food technology, analytical chemistry, environmental science, health, and nutrition science, seven food production SMEs, two medium and large enterprises producing packaging materials. Entrepreneurs were recruited to take part in the experimental event through a public application process. The company's motivation, attitude, interest, and readiness to participate in the co-creation process were the main criteria in choosing the entrepreneurs,

keeping in mind that the co-creation process elaborates on common challenges rather than specific issues of a particular company. The list of selection criteria also included the company's reputation in the industry.

Given the limited scientific expertise available in Latvia in the defined areas, the researchers were approached in person through VPR and Riga Technical University cooperation networks. The most important factors in choosing researchers were their research applicability to the industry's defined needs, the researchers' complementary knowledge and skills, their motivation, attitude, and interest in and readiness to engage in co-creation, as well as their professional reputation.

Although the co-creation process is based on dialogue and a free flow of ideas, it must nevertheless be smartly structured and managed to ensure a productive, constructive process and also its outcome. Organizing a successful innovation co-creation requires teamwork in which each participant has clearly defined roles and responsibilities. In this experiment, the process was moderated by seven persons. The total defined number of participants in the experiment for optimal coordination of the online event, including the moderator and assistants of the event, was 20 people. The piloting took place from June 1 till November 30, 2020.

Since the piloting of the methodological framework coincided with the Covid-19 pandemic caused social distancing requirements, the whole process had to adjusted to the online environment. Six online tools were applied throughout the co-creation process, including Zoom, MS Teams, WhatsApp, Mentimeter, Miro, and Google Drive applications. In the process evaluation phase, the participants completed online questionnaires and participated in semi-structured interviews conducted by the experiment moderator. The purpose was to collect feedback on the innovation co-creation process and assessment of its results.

RESULTS

All the participants of the experiment admitted that online innovation co-creation is a new, unprecedented format of government-industry-research cooperation, which is suitable for establishing new contacts, gaining knowledge on the explored topic, and laying the foundation for further, more in-depth industrial research or experimental development between researchers and companies.

When innovation process involves participants with diverse knowledge, motivation, personality traits, from various industries and organisations, the challenges of knowledge creation and transfer become especially intense. In such circumstances, successful knowledge creation and transfer requires the traversal of numerous boundaries, the most common of which are knowledge boundaries - syntactic, semantic, and pragmatic boundaries, as well as barriers such as insufficient communication and collaboration skills, conflicting agendas and ambitions, and hierarchy of authority (Suija-Markova, Mezaka, Gaile-Sarkane, 2022). Therefore, professional moderation is crucial for the co-creation process to happen smoothly. There must be careful planning, trust in the group, continuous monitoring of group dynamics, and adaptability regarding the process and the outcome. Given the findings of this research study, it is critical that the co-creation process moderator meets with the assistants during the preparatory phase to discuss important topics such as group dynamics, communication strategies, and conflict resolution techniques, as well as provide practical advice on how to handle various situations.

In the phase of bridging co-creation, it is crucial not to consider problem solutions and not to be limited by what is already known, but to discuss the problem from as many angles as possible. This phase should conclude with a clearer comprehension of the industry's problems and a list of obstacles to be addressed during experimental co-creation. Due to the unpredictability of the outcome of the bridging stage, it is highly probable that one or more participants will wish to withdraw, or that it will be necessary to engage additional specialists from the missing areas of expertise. For example, during this experiment, packaging manufacturers and representatives of a waste collection and recycling company were successfully involved in the co-creation process at stages 4 and 6.

At the stage of engaging experiment participants, it became evident that entrepreneurs lack knowledge of Latvia's research capabilities and infrastructure. Some admitted they did not know where to find this information or where to begin. Consequently, a stage of intercommunication between the participants was incorporated into the methodological framework and shall remain as an integral part of it in the future. It occurred between the phase of bridging co-creation and the phase of experimental co-creation. The process was voluntary, and according to information available to the experiment organizers, both the entrepreneurs and the researchers took advantage of the opportunity to establish or maintain relationships with their peers in the scientific community.

During the experimental co-creation, the process of generating solutions to problems is gradual and structured, based on the design thinking method. However, due to the limited time and the online format of the experiment, the participants went through three stages of design thinking: empathizing, defining, and ideating. The process of generating solutions may seem easy and flowing, but when working in groups with different people, this is not always the case. Therefore, it is very important that after each task, the groups are given the opportunity to meet in a common space and discuss the progress of the task: how far each group has come, what difficulties they have encountered, where they are stuck and where they have succeeded. The conducted experiment showed that in this way, groups can inspire each other, pull forward those who are struggling with the process or give impetus to new ideas. The co-creation process is more enriching, if the pool of participating enterprises consists of SMEs and larger enterprises covering the value chain of the explored topic. The larger enterprises have more experience with research and innovation; thus, they can serve as a source of knowledge and inspiration for SMEs.

The experiment demonstrated that the bridging co-creation phase is suitable for the online environment, especially for a networking purpose, whereas the experimental co-creation phase would benefit more if it could happen in a physical setting. Thus, more experiments are needed to test the blended approach of co-creation. The participants also admitted that the co-creation process helps improving listening and cooperation skills, idea generation in a diverse group, and the overall digital literacy. However, to reach better results on the experimental co-creation, it is important to select narrower and more clearly defined problems.

CONCLUSIONS

The aim of this research study was to develop and test a methodological framework for government-research-industry innovation co-creation during the pre-competitive stage of innovation process, with a government institution serving as the process initiator and coordinator. The study demonstrated that the developed methodological framework is a useful tool for professionals involved in the day-to-day facilitation of collaboration between

researchers and businesses, such as business support and development professionals and innovation project managers. It is appropriate for laying the groundwork for more in-depth industrial research or experimental development between researchers and businesses. The developed methodology has been tested with one pilot group in Latvia. As a result, more tests shall be implemented to assess its suitability for and impact of the open innovation cocreation between the government-research-industry in an online, physical, or blended environment.

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