Stakeholder-Driven Conceptualization of Open Innovation Approaches in the SYNERGY Project

Janin Fauth, Clarissa Marquardt, Giulia Di Bari, Nicola Raule, Johanna Lisa Ronco, and Steffen G. Scholz

Abstract Since the late 90s, the way companies acquire novel ideas and bring resulting products to the market is in a paradigm shift moving towards open innovation concepts and making use of crowd-based approaches. This in particular affects the industrial technologies sector with its fast-moving advancements in the areas of Additive Manufacturing, Micro- and Nanotechnology and Industry4.0. Open innovation concepts together with stakeholder-driven engagement processes provide solutions for all parties involved in the innovation process—from research to intermediaries up to industrial realization. This paper reports an overview of the milestones of the open innovation evolution and describes the interactive engagement format established and carried out within the frame of the Interreg Central Europe (CE) project SYNERGY (CE1171) involving related stakeholder target groups in the conceptualization of an open innovation platform for state-of-the-art technologies. Creative formats like design thinking and crowdsourcing approaches were introduced to and applied by representatives from higher education and research, SMEs and industry and start-ups to create a catalogue of features required for the open innovation platform.
1 Introduction

1.1 Open Innovation Concepts for Industrial Technologies

Open innovation (OI) is a multifaceted [1] and multi-level phenomenon [2], which embraces various innovation modes [3] evolving overtime. Several theories of open innovation have accompanied this evolution [4], resulting in a wide range of open innovation concepts and applications. Among these applications, crowdfunding and crowdsourcing are surely the most popular. Crowdfunding is described as “an Internet-based funding method for the realization of an initiative through online distributed contributions and micro-sponsorships in the form of pledges of small monetary amounts by a large pool of people within a limited timeframe” [5]; crowdsourcing is a practice where an ordering party, e.g. a company, turns to the crowd to solve a problem in exchange of a reward. Despite the roots of open innovation dating back to the “90s, with the first disquisition on companies’ absorption capacity [6], its definition as a novel concept [4] stems from Chesbrough’s idea that “open innovation is a paradigm that assumes that firms can and should use external ideas, as well as internal ideas, […], as the firms look to advance their technology” [7]. In the early 2000s, open innovation appeared on the industrial scene as a new business knowledge methodology—opposite to close innovation—describing innovation processes characterized by an outward opening: a new paradigm to boost technology innovation, which does not stem from the intuition of few innovators, but by the involvement of communities [8].

This concept subsequently evolved into the new paradigm Open Innovation 2.0 (OI 2.0), introduced as part of the Digital Agenda for Europe [9] to tackle European key challenges. Open Innovation 2.0 aims at overturning the classical funnel-like linear open innovation model into an ecosystem-centred and cross-organizational view of innovation. The ecosystem characteristic represents the most important and distinguishing unit of success for an innovation exceeding by far the achievable outcomes and results by a single organization. OI 2.0 aims towards comprehensive networking and co-creative collaboration while involving all stakeholders from the Quadruple Helix Model namely government, academia, industry and—as a supplementary part to the triple helix model—the civil society [10].

This paper describes the design process of an open innovation engagement platform to facilitate stakeholder co-creation and collaboration towards a sustainable, ecosystem-centred approach of open innovation in Central Europe. The involvement of stakeholder groups from different professional backgrounds and regions will help to understand and map the communities’ needs and expectations for the envisioned open innovation environment supporting the stakeholder-centred transformation of innovation processes within advanced industrial technologies towards sustainable innovation.
1.2 Stakeholder Engagement Concepts

Along with the rise of OI 2.0, interactive stakeholder engagement formats have become increasingly important to provide appropriate exchange tools in collaboration networks and systems. Stakeholder engagement is described as the involvement of stakeholders that is people that are affected by or can affect the achievements of an organization's purpose, into organizational decision-making [11]. In particular, involving civil society as a representative for potential users and consumers, to better define the expected value of innovations, is considered an integral part of the innovation process as the fourth and novel component of the Quadruple Helix Model [10]. Thus, involving the civil society in open networks, where they can interact together with other stakeholders, guarantees on the one hand socially sustainable innovation approaches matching the physical innovations with social stakeholder expectations [12] and on the other hand, real opportunities for businesses, as it allows for market consensus testing for the launch of new products and services [13].

1.3 Crowdsourcing

Crowdsourcing is considered to be one possibility of stakeholder engagement in the frame of open innovation. Brabham defines crowdsourcing “as an online, distributed problem-solving and production model that leverages the collective intelligence of online communities to serve specific organizational goals” [14]. This implies the natural engagement of stakeholders into decision-making processes by inviting them to comment and share input on ideas and innovations that matter to them. In the context of this paper, crowdsourcing is considered to include all forms of sharing individual assets such as infrastructures, skills, competences and knowledge with experts from the crowd in creative and collaborative processes for the purpose of jointly solving specific research or innovation questions in the context of industrial technologies.

1.4 Design Thinking

Design thinking enables interactive stakeholder-driven product development whilst focusing on understanding the innovation process from a highly user-centred perspective. Brown [15] defines design thinking as “a discipline that uses the designer’s sensibility and methods to match people’s needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity”. This asks for constant feedback between the developed solutions and the target users within a six-step process.
The first step in the design thinking process is to fully “understand” a specific problem, the second is to “observe” and interact with the target groups with the outcomes of both steps allowing to “synthesize” all collected information towards the core problems. The next step “ideate” aims at generating new ideas to the established innovation spaces. The last two steps “prototype” and “test” aim at constructing the chosen ideas in a fully functioning prototype, testing it and providing user feedback in several feedback loops in order to acquire as much experience as possible from the target users [16].

2 The SYNERGY Project

The CE Interreg project SYNERGY (SYnergic Networking for innovativeness enhancement of central european actoRs focused on high-tech industry) was designed to strengthen linkages, cooperation and synergies between industry and intermediaries, academia, policy makers and civil society (Quadruple Helix Approach) in Central Europe in the framework of OI 2.0. The aim of the project is to define new crowd innovation-based services made accessible via an online platform. In doing so, a new Synergic Crowd Innovation Platform (SCIP) has been developed as a space for co-creation and enhancement in open innovation offering a full set of tools and features on crowdfunding, crowdsourcing, micro-working and infrastructure sharing to effectively support independent, stakeholder-driven innovation processes. For this purpose, the project started with an analysis of relevant innovation projects and organizations covering the most promising industrial technologies, which were subsequently, clustered into “Synergic Networks” for the key technology areas of Additive Manufacturing and 3D-Printing, Micro- and Nanotechnology and Industry 4.0. Within the digital twin of these networks, the new developed SynPro IT-tool offers selective matchmaking options to facilitate co-creation and collaboration. Continuing the “Synergic Networking”, stakeholder engagement workshops on Design Thinking and Simulated Crowdsourcing were held to define the stakeholders’ needs and expectations on open innovation for the services on the SCIP, which will be tested in pilot actions and communicated in strategy trainings. This study focuses on the selected stakeholder engagement approaches for the definition and user-centred development of the platform. Figure 1 presents the scheme of the SYNERGY project and implementation flow.

Fig. 1 Scheme of the SYNERGY project flow
3 Workshop Concept

Interactive workshop formats were selected as a proven means of stakeholder engagement to directly involve and interact with relevant stakeholder target groups to solve the main project research question, namely defining the stakeholders’ needs for trans-regional cooperation based on crowd innovation approaches for the development of the Synergic Crowd Innovation Platform. To encourage active participation, optimal engagement and effective co-creation processes among the stakeholders, the workshops were designed based on selected creative open innovation concepts such as Design Thinking and Simulated Crowdsourcing. The focus of the design thinking approach is to identify and fully understand the future main user groups of the platform and to ultimately define the key topics and needs related to the mandate of the identified individual user groups. Following up on these observations, the participants systematically ideate new solutions matching the identified key issues and needs followed by prototyping and testing of selected ideas with regard to the platform while providing user feedback during all steps of the development process. The Simulated Crowdsourcing workshop concentrated on involving the present crowd of stakeholders into the identification of information, skills, competences and infrastructures that could be shared on the platform. The two workshops are designed in a complementary and iterative manner both contributing to solve project-specific questions while allowing for systematic, logical and practical [11] stakeholder engagement.

The first stage of the workshop concept involves six regional workshops in Poland, Austria, Germany, Slovenia, Croatia and Italy followed by a joint international workshop held in Germany in the second stage while collecting input from all relevant trans-regional stakeholder groups. Figure 2 presents an overview of the synergistic workshop concept.

Fig. 2 Overview of the synergistic workshop concept of stakeholder engagement in the frame of the development of an open innovation platform concept
The outcomes of the complementary workshops will be combined to jointly consolidate the main features for the conceptualization of the envisioned SCIP together with the stakeholders. A harmonized feedback form is used to collect stakeholder input and feedback for the different workshops and outcomes ultimately evaluated based on a five-step process aiming at the definition of stakeholder value propositions. This evaluation system presents the application of the concept for co-creating stakeholder value propositions as proposed by Frow and Payne [17] in a modified version. The resulting modified evaluation steps are (1) Identify stakeholders, (2) Define core values, (3) Evaluate stakeholder dialogue and knowledge sharing, (4) Identify stakeholder value co-creation opportunities and (5) Co-create stakeholders value propositions.

4 Workshop Results

The following workshop results are based on input generated by 130 stakeholder representatives from R&D organizations, universities, large enterprises, SMEs, start-ups, business support organizations, industry clusters and NGOs that were recruited via the SYNERGY partner organizations. The outcomes from both workshops offer a comprehensive overview of the stakeholders’ standpoints and needs for open innovation services resulting in the requirements for the SCIP. The following chapters present the detailed results according to the evaluation steps presented in the previous chapter.

4.1 Identification of Stakeholders

The stakeholder identification process focused on the pinpointing of the most important future user groups for the platform based on their existing needs, issues and professional backgrounds. As a result from the stakeholder engagement workshops, the three most important identified target user groups for the envisioned open innovation platform are start-ups, higher education and research organizations, industry and SMEs. Even if large industry and SMEs are usually considered two separate stakeholder groups, they did not show significant differences in their needs and issues related to the open innovation platform identified from both groups with the help of the harmonized feedback form. Industry and SMEs were therefore clustered together into one industrial target user group.
4.2 Definition of Core Values

One of the core values of the SYNERGY project is to increase and maximize the stakeholder value within advanced industrial technologies. As an essential and first step, the stakeholders’ core tasks and related needs and problems were defined to determine the activities needed to achieve these values. This allowed an overall picture and abstract representation of the different stakeholders’ points of view, whereby the consideration was limited to the three most important user groups namely start-ups, higher education and research, and industry and SMEs. Tables 1, 2 and 3 present the results for the respective target user groups.

Start-Ups
See Table 1.

Higher Education and Research Organizations
See Table 2.

**Table 1** Profiling of the target group start-ups related to tasks, needs and problems

| Tasks                              | Needs                                        | Problems                                |
|------------------------------------|----------------------------------------------|-----------------------------------------|
| Enhance innovation and growth      | Cooperation partners (e.g. experts with experience) | Lack of experience                      |
| Develop and introduce new products and services | Possibilities for testing products and services | High competition and lack of customer base |
| Grow activities around established ideas | Financial assistance                              | Lack of financial sources               |
| Increase the number of committed employees | New employees (e.g. offspring talents)        | Lack of infrastructures                 |

**Table 2** Profiling of the target group higher education and research related to tasks, needs and problems

| Tasks                              | Needs                                        | Problems                                        |
|------------------------------------|----------------------------------------------|-------------------------------------------------|
| Research (and teaching)            | Practical application and testing of research outputs | Confidentiality of new research outputs        |
| Spread and generate new knowledge  | Competent partners (e.g. for partial research results) | High administrative effort (e.g. large complexity of research proposals) |
| Networking and contacts to business and new research projects | Employment market (e.g. Ph.D. students) and (follow-up) financing | Problems to identify future users and competent partners |
| Publications                       | Possibilities for personal portfolio development | Publications required for personal and/or strategic development |
### Table 3  Profiling of the target group industry and SMEs related to tasks, needs and problems

| Tasks                                      | Needs                                      | Problems                                      |
|--------------------------------------------|--------------------------------------------|-----------------------------------------------|
| Fulfil production targets and make profit  | Knowledge database on: current research topics, market research results, etc. | Lack of knowledge on current research topics and technologies |
| Satisfy customer needs                     | Database for infrastructures to share (e.g. machines, etc.) | Lack of overview of potential partners         |
| Strategic development and positioning      | Cooperation partners (e.g. from research)   | Lack of offspring and skilled workers          |
| Provide competitive advantage              | Employment market for offspring talents and skilled workers | Confidentiality of information                |

#### Industry and SMEs

See Table 3.

#### 4.3 Evaluation of Results from Stakeholder Dialogue and Knowledge Sharing

Following the overview of the various stakeholder points of view, the stakeholders’ general needs and expectations for collaboration in an open innovation environment were evaluated based on the results from the extensive stakeholder communication and knowledge sharing processes in the workshops. This resulted in ideas for collaboration mechanisms in the form of sharing skills or competences and infrastructures in the advanced technologies sector and in the desired functionalities of the SCIP.

#### Needs and Expectations for Sharing Skills and Competences

Stakeholders confirmed that the envisioned open innovation approach should provide collaboration mechanisms for sharing skills and competences in advanced industrial technologies. Stakeholders suggested different categories of skills and competences that could be shared via the open innovation platform. These categories are management services (e.g. innovation management services), experience and expertise (e.g. research expertise), knowledge from specialty areas (e.g. additive manufacturing) and design optimization (e.g. design optimization for additive manufacturing).

#### Needs and Expectations for Sharing Infrastructures

The introduction of collaboration mechanisms facilitating sharing of infrastructures was also encouraged by the workshop participants. According to the workshops’ results, ideas for infrastructures to be put at disposal and shared with interested parties in the form of renting, trainings or other applications are equipment (e.g. monitoring tools), facilities (e.g. innovation labs), infrastructure services (e.g. evaluation of data), materials and products (e.g. production lines) and computer applications (e.g. gamification applications).
**Required Platform Functionalities**

Based on the key services that the platform should fulfil, the participants’ ideas and expectations on future functionalities of the open innovation platform were evaluated, resulting in different categories of functionalities. In terms of technical functions, the potential users envisage, for example, matchmaking functionalities, a straightforward registration process, a user-friendly and intuitive user-interface, individual participants’ profiles, intelligent searching and content mining mechanisms, rating systems for crowd-evaluation of project ideas and virtual reality features. Desired functionalities for communication and interaction comprise ideas like real-time communication possibilities, a discussion forum on general topics, a virtual co-working space and e-mail notification for successful matchmaking between platform users. Examples for content-related functionalities encompass thematic areas to cluster campaigns and challenges, an integrated business-science translator, links to external tools and contents and the demonstration of best practices and success stories.

To consolidate the workshops’ outcomes and define the minimum requirements for the open innovation platform, the workshop participants voted on the nine most important features to be considered during the conceptualization and realization of the platform. This resulted in the following minimum requirements for the SCIP: user-friendly and intuitive interface, Web and mobile version, matchmaking option, sharing option for skills/infrastructures/services, communication tool, innovation challenges, automated notification system, training materials and crowdfunding feature.

5 Lessons Learnt and Outlook

This study explored stakeholder-driven approaches towards the definition and initiation of successful trans-regional cooperation based on open innovation among relevant project stakeholders in Central Europe. To achieve this aim, iterative workshops on Design Thinking and Simulated Crowdsourcing were conducted to involve stakeholders from all project partner regions and varying professional backgrounds to understand their needs and issues related to open innovation within the context of advanced industrial technologies. This resulted in identifying the most relevant user groups, their key topics and issues for the planned open innovation platform contributing to consolidate a catalogue of required features as condition for the development of the final functionalities of the open innovation platform. The resulting initial stakeholder value propositions emphasized that matchmaking among innovation actors and a corresponding user-friendly, intuitive and mobile tool are the most important stakeholder topics. In addition, the importance of cooperation and communication between academics, research and industry was stressed, as these sectors are still considered as separate entities in some partner countries causing lack of awareness of the importance of such collaboration, while the Synergic Crowd Innovation Platform contributes towards filling this gap.
The SYNERGY project approach, which aims at satisfying the need of specific tools that support and provide a stable structure to connections among stakeholders, could become relevant in emergency situations such as the sudden spread of the Covid-19 worldwide pandemic. Indeed, two recent examples from the field of 3D-Printing [18, 19] have proven the existence and potential of the crowd innovation era. In these cases, different stakeholders merged their effort to provide innovative solutions to the lack of components for life saving ventilation devices. However, it can be noted that this kind of collaboration is mainly animated by the urgency of a social need and the nobility of the purpose and can happen only if the appropriate connections among stakeholders are already established. Furthermore, the link to the business world, with appropriate business models and success stories, is still missing. In this context, the SYNERGY approach aims at solving this issue by creating a stable collaboration framework among stakeholders.

Therefore, the analysis on the conceptualization of the SYNERGY open innovation approaches will be continued in future investigations while following up on the steps on co-creation of stakeholders’ value propositions proposed by Frow and Payne [17]. Further opportunities for stakeholder value co-creation will be created within the SYNERGY project by the introduction of the open innovation platform and the involvement of all user groups into problem-solving processes within innovation campaigns and challenges. Consequently, the respective user experiences on the platform will be considered in the pilot actions to be held on the Synergic Crowd Innovation Platform (https://synergyplatform.pwr.edu.pl/) to adjust the co-creation of stakeholders’ value propositions. All in all, the stakeholder-driven approach adopted under the SYNERGY project will result in shaping open innovation collaboration mechanisms according to the needs of stakeholders aiming at the creation of a socially sustainable innovation environment.

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