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**Title:** Open Innovation Cultures

**Year:** 2023

**Version:** Accepted Manuscript

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### **Please cite the original version:**

Macher, G., Narayan, R., Dragicevic, N., Leino, T. & Veledar, O. (2023). Open Innovation Cultures. In: Yilmaz, M., Clarke, P., Riel, A. & Messnarz, R. (eds.) *Systems, Software and Services Process Improvement: 30th European Conference, EuroSPI 2023, Grenoble, France, August 30 – September 1, 2023, Proceedings, Part II*, 275–286. Communications in Computer and Information Science, 1891. Cham: Springer. [https://doi.org/10.1007/978-3-031-42310-9\\_20](https://doi.org/10.1007/978-3-031-42310-9_20)

# Open Innovation Cultures

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**Abstract.** Multiple sectors are experiencing high uncertainty in terms of disruptive technologies and market changes. Continuous uncertainty in business evolution is triggering the need for concepts that explore distributed and open innovation, networking effects, and ambidexterity approaches. Therefore, open innovation, a term that is used to promote a mindset toward innovation that runs against the silo mentality and closed innovation of traditional corporates, is used frequently in multiple research areas. Nevertheless, these different research areas identify and specify open innovation in different ways.

Therefore, this paper will concentrate on open innovation effects and implications from the different research perspectives of (a) the societal level, (b) the organizational level, (c) the human resource and (informal) leadership level, and (d) the engineering technology level perspective. The work establishes a basic mutual understanding of insights into open innovation from different research focuses.

**Keywords:** open innovation, socio technology impact, human resource management.

## 1 Introduction

Currently, different sectors are experiencing high uncertainty in terms of disruptive technologies and market changes. Stable approaches, products, or architectures of companies are a risky game [4] and can become barriers to innovation. The uncertainty of business evolution is nevertheless considered to be ongoing [11]. Thus, response scenarios shall imply open innovation approaches and integration of open community or platform networks. Concepts that explore distributed and open innovation, networking effects, and ambidexterity approaches are the most promising. Therefore, open innovation, a term that is used to promote a mindset toward innovation that runs against the silo mentality and closed innovation of traditional corporates, is used frequently in multiple research areas with different attention.

Open innovation has had various concrete examples of the **impact on the societal level**. One example is related to the medical domain, where open medicine projects have provided a collaborative initiative that brings together healthcare professionals, patients, and researchers to develop innovative healthcare solutions. The European Union is also leveraging open innovation to develop new and sustainable solutions. The striking example, in this case, is the European Union's Horizon 2020 program, which provides funding for research and development. Through this program, researchers, innovators, and industry experts work together to develop new and innovative solutions. Open innovation has also had a significant impact on education. Examples are online educational platforms that provide free access to high-quality educational materials to students around the world. Overall, open innovation has had a significant impact on the societal level by enabling collaboration between various stakeholders and driving innovation that addresses complex social challenges. This topic is also becoming more dominant via multiple Horizon Europe programm and multiple projects, like FLAMENCO. A recent project focusing on Forward Looking Approaches for Green Mobility Ecosystem Network Collaboration (FLAMENCO) [6].

**On an organizational level**, open innovation has been increasingly adopted to leverage external expertise and resources and foster innovation. However, there are several challenges associated with the research and practice of open innovation practices. One key challenge is the lack of a comprehensive approach that considers the interactions and interdependencies among different factors, such as technology, stakeholders, and society [34]. This can result in a fragmented understanding of open innovation and hinder its potential for generating innovative solutions and value for organizations and society. To address this challenge, more holistic approaches that integrate different perspectives and expertise are needed. On organizational level, such as the combination of open innovation and design thinking, which can provide a framework for generating and evaluating new ideas, prototyping and testing solutions, and integrating feedback from stakeholders, is typically used.

Informal leadership, as an additional viewpoint of the relation of open innovation to **human resources and people management**, can play an essential role in the design and implementation of collaborative projects [19]. Recent publications related to the topic of open innovation and human resources found that HRM work is mainly conducted through informal means, separate from the host corporation's business as usual [37]. Another study found that there is growing interest in the human aspects of open innovation, and that an important challenge for managing open innovation remains the motivation of individuals for knowledge sharing and sourcing [9]. In these implementations, the role of informal leadership can emerge for one or more people in the group. Open innovation can thereby benefit from informal leadership. Cooperation and development between organizations ultimately take place between individuals. In turn, support for development within the organization supports this inter cooperation. The role of informal leadership in such collaboration can be a catalyst and a source of initiative that maintains the collaboration through actually taking leadership actions to meet the goals of the group.

Open innovation from an **engineering perspective** is frequently seen in the context of digitalization and novel technology-based solutions [36]. The value creation in technology focus is supported through innovation focused on accelerated development, validation, and deployment of innovative assets with improved quality. This trend is further supported by the technology push and the market pull [26], [21]. By embracing these changes, organizations become heavily reliant on innovations. That concerns innovation management as a driver of sustainable business models and collective maximization of benefits. While, therefore, research suggests open cooperation and business model innovation as the vital components for success [14, 26].

This paper will concentrate on open innovation effects and implications from different research perspectives. To that aim, the analysis presented in this paper integrated the different research perspectives on (a) the societal level, (b) the organizational level, (c) the human resource and (informal) leadership level, and (d) the engineering technology perspective. Within the scope of this work, we present the different research viewpoints and implications derived from the different views of the analysis of open innovation capabilities. The aim of this analysis is to establish a basic mutual understanding of different insights into open innovation from different research focuses. The paper is organized as follows: Section 2 describes the related work and literature review of the different research perspectives. Followed by Section 3 highlighting the contribution of open innovation concepts in the individual research fields and describes the outcomes and conclusions that can be drawn from the individual research perspectives. Finally, the relation to the SPI manifesto is provided, and the work is concluded in Section 4.

## 2 View Points and Related Work

In this section, related work on open innovation from different research perspectives is analysed. To that aim the analysis presents perspectives on (a) the societal level, (b) the organizational level, (c) the human resource and (informal) leadership level, and (d) the engineering technology perspectives on open innovation. Since one of the key challenges in open innovation is related to the fact, that it encompasses a very wide range of research streams, innovation activities, and organizational practices. These factors are leading to inconsistencies and ambiguities in how it is operationalized and implemented in organizations [13]. The complexity of open innovation from the perspective of technology, stakeholders, and wider society and environment has also been highlighted as a challenge by Vanhaverbeke et al. [35]. The authors mention the requirement for a more comprehensive and integrated approach that considers these factors when talking about open innovation. A rather scientific analysis of the past, present and future of open innovation is also conducted by Bigliardi et al. [1].

### 2.1 Societal Level

The work of Lancker [18] shows that also public research organizations need to increasingly engage in open innovation processes besides classic collaboration

with industry and public-private partnerships. Their study examines the effectiveness of an open innovation approach by a public research institute, as well as influencing factors, which provides insights towards the applicability of open innovation in a public research environment.

Another example of circular-oriented innovation is provided by Brown et al. [2]. In this paper, implementations of circular economy strategies and empirical investigations on such collaborations are conducted. The research focuses on how practitioners in the Netherlands have conducted collaborative circular-oriented innovation. The authors highlight the need for future research on the assessment of the current modes of collaborative innovation are sufficient to deliver a circular economy transition.

The research of Pedersen [27] identifies five different purposes for using open innovation. It also suggests that public sector organisations primarily use open innovation to pursue one specific purpose, innovation in society. Which means creating value by improving citizens' quality of life and the quality of neighbourhoods. The research also indicates that open innovation, until now, has primarily been used to solve minor problems, and not large-scale problems of society.

Sims et al. [31] conduct an in-depth case study of an open-source software community providing affordable medical record-keeping software in developing nations. The study creates an understanding of open innovation communities and their role in addressing societal challenges.

Also, the works related to the FLAMENCO project [6], focus on piloting forward-looking approaches and methods to enable sustainable collaboration on skills for the automotive domain can be considered in this context.

## 2.2 Organisational Level

Dahlander and Gann [7] highlight the need for a more comprehensive and integrated approach that considers different factors of open innovation on the organizational level. For instance, open innovation processes can sometimes focus too much on technological capabilities and overlook user needs and preferences. Implementing open innovation can be met with resistance from internal stakeholders, who may be resistant to change. This lack of clarity and integration hinders the potential of open innovation to generate innovation and create value for organizations and the wider society. In this sense, there is a potential to connect this approach with other, similar approaches to explore potential complementariness. One such approach having theoretical and empirical complementarities with open innovation is design thinking (DT), an approach to innovation inspired by how designers think and work, used by many managers, consultants, and other practitioners worldwide [23]. Both approaches emphasize the importance of collaboration and knowledge sharing with external stakeholders, as well as a focus on the user or customer [5]. Design thinking approaches can provide a framework for generating and evaluating new ideas, prototyping and testing solutions, and integrating feedback from stakeholders, which are all essential elements of open innovation [3]. Therefore, integrating DT into open innovation practices can potentially help to bridge the gap between research and

practice and enhance the effectiveness of open innovation for generating innovative solutions and creating value for organizations and society. While DT has been extensively related to innovation more generally [30] and to service innovation [8], still more efforts in connecting DT and open innovation are needed.

Sivam et al. [32] examine settings for the Open Innovation Arena. The paper aims at analysis of factors which influence open innovation and how firms can create an effective arena to gain access to external knowledge. The study concludes that culture, leadership and strategy, are the main drivers to an open innovation arena.

### 2.3 Human Resources Level

Human resource management has major contributions to human aspects in general and therefore to open innovation capacities in special. One of the most important challenges for managing open innovation remains the motivation of individuals for knowledge sharing and sourcing [9].

Therefore, also Jotaba et al. [15] conducted a systematic literature review on innovation and human resource management to evaluate any potential patterns among scientific articles. A growing interest in the role of strategic human resource management (SHRM) in managing employees and supporting their capacity for innovation in high-tech firms could be identified.

Similar findings Engelsberger et al. [10] identified in their paper where the authors also introduced the OI mindset as a new concept that is critical for organizations. Their findings include an emphasis on collaboration incentivizes for employees to participate in knowledge exchange and that managers can influence open innovation by establishing a shared mindset through specific SHRM practices

Natalicchio et al. [25] investigated open innovation and HR factors in an Italian manufacturing sector. The purpose of their work was to understand how the adoption of open innovation (OI) strategy influences the innovation performance of firms, and how this can be moderated by the recruitment and training of employees.

In the work of Naqshbandi [24], the relationships between empowering leadership style and inbound and outbound open innovation are analysed. The results indicate strong positive effects of empowering leadership on open innovation and the mediating role of employee involvement climate.

The keynote paper of Riel et al. [28] investigates trends in industrial companies with the objective to identify key competencies of Innovation Managers. The work already highlights the importance of innovation management that evolves from product development and manufacturing, and includes the need for designing career paths and management support.

### 2.4 Technology Level

In the context of technology and engineering, the focus of open innovation is mostly the improvement of development processes and methods, which are the

focusing on open innovation [26]. In this work, the author also highlights the engineering focus highly related to product innovation, than rather on market change or customer-base innovation. Such an example is also provided by an open innovation community platform Industry meets Makers (IMM)<sup>5</sup>. Where the focus is to initiate new collaboration models between the industry and the creative maker scene in order to make the resulting innovation and business potential fruitful for the benefit of both sides. The platform also focuses mainly on future technology collaboration support but aims to attract also start-ups, SMEs, freelance developers, designers, students, researchers, and hobbyists.

A study conducted by Harel et al. [12] on open innovation in small businesses in the industry and craft sectors showed that the utilization of open innovation (OI) tools are effective in promoting innovation in small businesses. The authors found out that OIT tools contributed mainly to the level of product innovation, but they also identified the utilization of networking and external collaboration contributes more to levels of innovation.

In their work in the context of digital innovation, Riel et al. [29] focus on how to leverage and push innovation from bottom-up by mobilizing the creativity and diversity of the workforce in engineering. Their attempt on fostering the democratization of innovation is based on the appropriate empowerment of the workforce and making them act as innovation agents on all levels and organizational positions.

How open innovation activities influence the Korean new information and communications technology (ICT) industry is analysed by Kim [16]. Their results indicate that the level and intensity of companies' technological cooperation impact their innovation potential. Therefore, the authors also suggest the construction of technological innovation networks.

Madrid-Guijarro [22] also focus his work on SME and their favouring of open innovation related to promoting product and process innovations, but identifies that the effect on human-centred innovation would be even bigger.

Overall, open innovation shows tremendous potential for positive impact by enabling companies to access new external ideas and expertise, accelerate innovation, and improve quality and competitiveness, but in the technology context, is frequently focused solely on development processes, products, or (less often) service innovation.

### 3 Contribution of OpenInnovation Concepts in Individual Respective

In this section, possible potentials and opportunities of open innovation for the different research perspectives of (a) the societal level, (b) the organizational level, (c) the human resource and (informal) leadership level, and (d) the engineering technology perspectives are provided. Each field of research focuses and interprets open innovation slightly differently. Therefore, this section shall provide a common view and suggestions on a more holistic way of open innovation.

<sup>5</sup> <https://www.industrymeetmakers.com/>

### 3.1 Societal Level

As mentioned in the introduction, open innovation can have a huge impact on the societal level. Here the examples of the European Union's Horizon 2020 program or open learning platforms (like DRIVES platform<sup>6</sup> or EuroSPI academy<sup>7</sup>) shall be mentioned. These platforms, in their own context, enable the engagement and interchange of the different stakeholders of open innovation and create potential impact on the societal level. By providing funding for research and development or through providing access to fast up and reskilling for individual competencies [20, 33] and thus enabling agency of social stakeholders and potential of societal change.

Open innovation practices that can be used to tackle societal challenges shall include external knowledge sources and most important paths to market them internally. The imperative shall not be direct business enhancement but rather open access, open source and open-source potentials. Big opportunities are related to motivating the community and connecting with young talents.

Therefore, make social behaviour beneficial in the company (socialization and reward systems – everything should make it difficult to benefit oneself at others' expense).

Build platforms and ecosystems to promote purposeful collaboration, which includes:

- Harvesting of value from knowledge platforms
- Pursue new collaboration opportunities (e.g. R&D project consortia)
- Exploiting available data ecosystems
- Involve synergy networks and circular economy thinking
- Harness the intelligence of employees and empower workforce
- Imply different strategies for keeping employees' competencies up to date

Use crowdsourcing approaches to tighten open innovation at the societal level with feedback from a large group of stakeholders. Crowdsourcing can be used to generate ideas for new products or services, as well as to identify and solve social problems.

Engage with open data initiatives to spur innovation by providing access to data that can be used to develop new products or services, as well as to address social and environmental challenges.

### 3.2 Organisational Level

For organisational-level open innovation, the design thinking (DT) concept provides an approach that emphasizes empathizing with users, defining problems, ideating potential solutions, prototyping and testing. Due to these characteristics, DT is inherently related to open innovation research areas. The DT approach can therefore be effectively applied to open innovation practices to foster a culture of collaboration and engagement among internal stakeholders. Design

<sup>6</sup> <https://www.project-drives.eu/en/home>

<sup>7</sup> <https://academy.eurospi.net/>

thinking can help to create a more collaborative and inclusive environment, which can encourage participation and buy-in from different reluctant stakeholders within the company. Within the organisation, DT helps to diminish blind spots as it aspires to consider both customer and employee needs and perspectives and empowers them to engage in open innovation practices actively. In such a way, open innovation is promoted across the company, and everyone has a sense of ownership of its results, not only leadership. Iteration for innovation is a common DT characteristic and leads to faster development and decreased risk of open innovation solutions.

Open innovation provides a framework for collaborative innovation, enabling organizations to leverage internal and external expertise and resources on specific topics of interest. On the other hand, DT offers a human-centred approach to problem-solving and innovation, placing emphasis on understanding the needs and aspirations of stakeholders. When used in tandem, these two concepts can facilitate more effective and sustainable innovation strategies that are better aligned with the interests and values of stakeholders. Other recommendations include:

- Sharing of common organizational values
- Change the nature of work for employees - establish self-organized teams
- Deepen customer relationships
- Establish strategically significant research cooperation
- Upskilling/Reskilling of staff via educational programs (e.g. Erasmus+)
- Foster different forms of open innovation networks

### 3.3 Human Resources Level

Human resource management and leadership have been challenged a lot in recent years due to Covid and the shift of values of the employees. Open innovation can bring additional challenges and opportunities to human resources and leadership.

Open innovation requires a culture of openness, collaboration, and risk-taking. Therefore, leaders need to be open to fostering this culture by encouraging employees to share ideas, collaborate across departments, and experiment with new approaches. This can be challenging for established structures, but on the other hand, enables informal leadership. Therefore, informal leadership skills and benefits need to be enhanced and supported by organisational structures.

Open innovation involves collaborating with external partners as well as fostering a learning culture. Leaders will have to create a learning culture within their organization and participate in external networks and engage in continuous learning.

Rewarding and recognizing employees for their innovative contributions will be of high importance. By creating a culture that values and celebrates innovation, leaders can encourage employees to continue generating new ideas and solutions. Organizations need to be designed to make social behaviour advantageous (socialization and reward systems – everything should make it difficult to benefit oneself at others' expense).

The other people-related practices associated with the workforce shall change the nature of work for employees and boost their brainpower and skills. Informal leadership and a culture of innovation within the organization can also be used to create a more diverse and inclusive workplace, which also helps tap into talent pools and involve staff in the company.

Another idea to foster intrinsically motivated experts and prevent demotivating organisational context factors e.g. via sabbaticals for a few months, performance appraisals, career paths, and job design enabling a balance between research and service. Transfer such intrinsically motivated experts to establish self-organized cross-functional teams to achieve breakthrough innovations. The structure of such a self-managed team with (a) no specific job titles, (b) changing project roles and tasks, (c) freedom to collaborate and change responsibilities, and (d) transparency in task loads, costs, and time budget aims at performance management, individual development, and ownership of the individuals. This procedure favours fast, radical innovation and clear goal orientations of relatively small-sized teams composed of intrinsically motivated team members.

### 3.4 Technology Level

On an engineering level, technology can play a crucial role in enabling open innovation. Various platforms enable to facilitate collaboration and knowledge-sharing across departments and with external partners. But open innovation should not solely be focused on the development of technologies for process and product development. While open innovation has a significant impact on the engineering and technology of the resulting products and services, the impact in terms of the process of innovation should be focused.

As such, collaboration and knowledge sharing between different organizations and individuals can lead to the development of new technologies and solutions that would not have been possible through closed, in-house innovation processes. Thus, connecting with external expertise (including customers, suppliers, and research institutions) can help to accelerate development and improve quality. Additionally, the flexibility to engage with the external workforce provides more agility with changing market conditions and fast response to customer needs.

All forms of co-creation and collaborating with stakeholders, such as customers, employees, and community members, can be used to create new solutions or products. This can also include cooperation with business partners for technology scouting. By partnering with startups or investing in new technologies, companies can access new markets, build new capabilities, and stay ahead of the competition.

Other technology related open innovation includes hackathons and innovation challenges where diverse groups of people are brought together to work on specific technology or engineering challenges. These events are also usable to engage with external stakeholders, generate new ideas, and test new concepts.

Finally, the most prominent technology focused form of open innovation is related to open source development. For this model software developers make their source code publicly available, allowing anyone to modify and improve the

software. By contributing to open source projects, companies can also build their reputation and demonstrate their commitment to innovation.

## 4 Conclusion

This study highlights the significance of exploring the interplay between open innovation and (a) the societal level, (b) the organizational level, (c) the human resource and (informal) leadership level, and (d) the engineering technology practices. By adopting a more integrated and holistic approach to innovation, individuals, organizations, and society can address some of the challenges associated with open innovation better. Describing this holistic concept highlights overlaps between the silo concepts of open innovation and bridges the gap of understanding between the four research areas. The paper presented the different research viewpoints and implications derived from the different views of the analysis of open innovation capabilities. The presented concept can have far-reaching implications for societal and environmental impact, ultimately driving sustainable growth and creating value for a wider range of stakeholders. Therefore, there is a need for further research to investigate and identify the most effective ways to leverage the potential complementarity between these concepts. Considering the line of argumentation of the paper, a more holistic approach to innovation that incorporates the presented principles will provide organizations with better navigation through the complexities of open innovation and maximize their impact.

## 5 Relation to SPI Manifesto

This paper contributes to the principles and values described in the SPI manifesto of the EuroSPI community [17], with a specific focus on enhancing the involvement of people through expanding their awareness of the agency they have (A.2). Additionally, the paper aims to promote the creation of learning organizations and environments (4.1) to support the vision of different organizations and empower additional business objectives (5.1). The objectives outlined in this paper are related to changing the context (C.1) and adapting values (C.2) in order to bring about changes in businesses and their values (B.2).

## Acknowledgments

This research has received funding from the Horizon 2020 Programme of the European Union within the OpenInnoTrain project under grant agreement no. 823971. The content of this publication does not reflect the official opinion of the European Union. Responsibility for the information and views expressed in the publication lies entirely with the author(s).

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