

Linking Circular Innovation with ‘Open Innovation’ Paradigm: A Stakeholder Approach

Małgorzata Runiewicz-Wardyn¹

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Abstract

The paper aims to investigate how open innovations (OI) paradigm, based on the principle of the collaboration between the innovation ecosystem stakeholders can contribute to the adoption and promotion of the circular economy (CE). The engagement in the knowledge, technology and resource sharing between the Quadruple Helix (QH) stakeholders – enterprises, academia, society, government - is crucial for the transition to the CE model. The paper introduces the concept of the open circular innovation ecosystem (OCIE), its key stakeholders as well as discusses the drivers and barriers leading to the successful OCIE.

Keywords: Circular Innovation, Open Innovation, Quadruple Helix Stakeholders, Open Circular Innovation Ecosystem

1. INTRODUCTION

Peter F. Drucker (1985) was of the view that purposeful, systematic innovation begins with analysis of opportunities that ‘changes’ may offer for economic and social innovation. The concept of a circularity is linked to the entirely new ideas, materials, technologies and types of communities. The model of circular innovation (CI) introduces the completely new ways to meet the market needs profitably. It involves activities such as sharing resources, leasing, reusing, repairing, refurbishing and recycling existing materials and products. In this way, the life cycle of products is extended, and the R&D outcomes meet both economic and sustainability goals. Yet, in order circular model to succeed innovation collaboration and sharing resources and technology (knowledge, equipment, materials, R&D findings and professional expertise) is needed. Therefore, the paradigm of open innovation (OI), promoting R&D collaboration, and technology, knowledge and talent sharing opens new opportunities for the CE. Although both concepts – OI and CE - have been widely accepted by both researchers and practitioners, there is still a lack of thorough discussion of the conceptual link between these two paradigm shifts in the context of open innovation ecosystem and quadruple helix (QH) environment. The paper attempts to fill this research gap by addressing the conceptual links between OI and the CE paradigms and introducing the concept of the open circular innovation ecosystem (OCIE) – its major stakeholders, and major drivers and barriers.

2. ‘OPEN INNOVATION’ PARADIGM AND OPEN CIRCULAR INNOVATION ECOSYSTEM

The accelerating globalisation processes, challenges of environmental sustainability, the development of modern technologies and knowledge-based economy force the companies to search for easier and

¹ Department of Economics, Kozminski University, Warsaw, Poland, correspondence address: mruniewi@alk.edu.pl

quicker access to the latest knowledge and technology (Runiewicz-Wardyn, 2022). The paradigm of the OI assumes that creating a business model based on sharing IP with other organisations is more important than entering the market first (Chesbrough 2003). Hence, OI business model could be defined as the practice of businesses and organizations to integrate the innovation ideas from both internal and external collaborators - other firms (suppliers, customers, competitors and consultants) and organisations (such as universities or public research bodies). The significance of innovation collaboration within the CE has been emphasized by numerous researchers, i.e. Wilson and Thakur, 2023; Eisenreich and Füller, 2023; Konietzko et al., 2020; Brown et al., 2019 and Eisenreich et al., 2021. Brown et al. (2019) introduced the concept of “collaborative circular oriented innovation”, defined as the set of activities that integrate circular economy practices into innovation processes. More recent papers by Konietzko et al. (2020) and Eisenreich et al. (2021) discuss the concept of circular innovation ecosystem (CIE), which considers QH stakeholders – enterprises, academia, society, government - engagement crucial for the success of circular innovation.

3. OPEN CIRCULAR INNOVATION ECOSYSTEM

In the CIE companies need to innovate with not just better products and technologies, but new business models, supply chains, and marketplaces as well. The main difference between the CIE and open circular innovation ecosystem (OCIE) is that the first one can be defined as just a set of actors who co-evolve separately in their technological capabilities, knowledge, and skills leading to the CE solutions, whereas in the second one ecosystem actors share resources, transfer knowledge & technology, collaborate in the co-creation of new technologies and solutions for the CE. The second. In both models, the local stakeholders can enhance network performance by acting as brokers and facilitating the acquisition of knowledge (Figure 1).

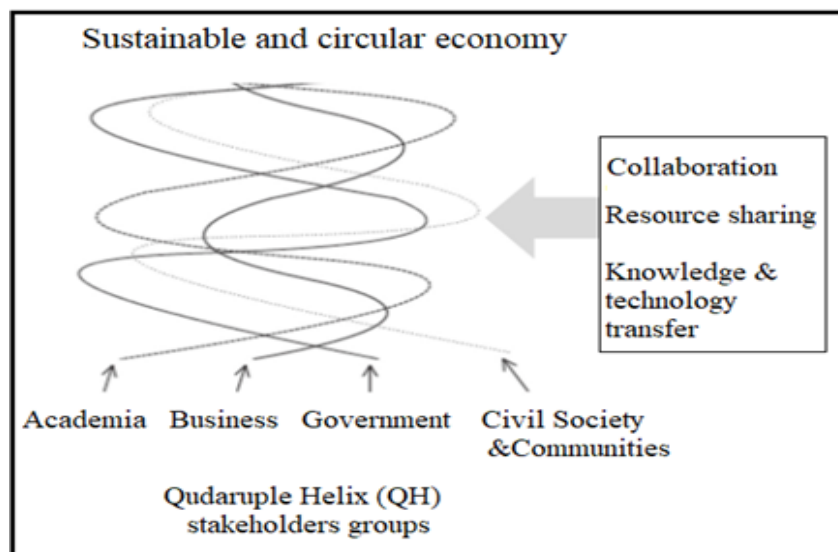


Figure 1. Role of Stakeholders in the OCIE

In the OCIE the benefit is achieved through sharing the unique resources, R&D engagement, knowledge and inter-organisational learning. To further investigate OCIE, the section below considers each stakeholders` group role in the OCIE.

3.1 Role of academia in the OCIE

Universities can provide both technical and marketing expertise. University-industry joint R&D collaboration, university-centred clusters and university-industry research centres represent a major channel through which universities contribute to the open circular innovation partnerships with firms.

Some other university innovation and knowledge transfer mechanisms include informal interactions, via conferences, training of business employees by academics or joint supervision of PhDs, joint publications or the sharing of R&D facilities. One example include Nokia Research Centre (http://projects.csail.mit.edu/nrcc/about_nrcc.php), which actively engages in promoting open circular innovation through academic partnerships with leading institutions like MIT, Stanford, and University of California. The company leverages ideas by exploring academia expertise and sharing resources. Another example include IBM and its Open Collaboration Research Programme (<https://research.ibm.com>). The Programme aims to build strong university-industry partnerships to create smart IT solutions that will be publicly shared.

3.2 Role of business in the OCIE

Much of the literature attempting to explain the role of external sourcing for circular innovations, studies the benefits of coupled processes, such as R&D collaborations and technology alliances (Bayona et al. 2001). For example, in the renewable energy sector leasing technology enables a building company to use a renewable energy installation without having to buy it. The installation is owned or invested in by another party i.e. financial institution such as a bank (see Stunning Renovation Hub, <https://renovation-hub.eu>). Furthermore, Bayona et al. (2001) shows that cooperative R&D agreements between firms are more frequent in sectors with high technological complexity and interdisciplinarity. The OCI collaboration has already been practiced in the food industry. Two well known companies, Nestlé and Danone, have collaborated with Veolia, a waste management company, to develop a new circular packaging system. As a result it reduced the costs of R&D and technology adaptation, and improved waste-recycling capabilities of all companies (<https://www.veolia.com/fr/newsroom/actualites/>). The expected resource scarcity may be another strong argument to introduce circular innovative solutions and collaborate in the open innovation circular way. Whereas, the low price of resources still enables successful linear business models in many other various industrial sectors.

3.3 Role of government in the OCIE

The various drivers and barriers affect a company's motivation to introduce circular solutions or engage into circular open innovation cooperation. Therefore active role for government, either through direct involvement in the innovation process or through collaborating on fundamental and legal issues is important. Moreover, government is responsible for setting robust standards and norms in production, expansion of circular procurement, tax incentives for circular products, support for eco-industrial parks and R&D partnerships and more generally awareness campaigns. Cluster organisations can take action to increase awareness of the circular economy among companies. One example is a matchmaking platform the European Cluster Collaboration Platform (<https://clustercollaboration.eu>). Many EU Member States have received governmental support for collaborations in the fields of green energy, car sharing, smart buildings and local food (*Horizon Europe Work programme 2023-24*).

3.4 Role of user communities in the OCIE

Gallaud and Laperche (2016) emphasize that users can be considered central enablers of the CE. Circular users practices fit into the circular value networks, and influence the process of the resource consumption in order to keep materials and products in use as long as possible. In the past decade, especially in the last post- Covid period, the customers` attitudes have risen towards greater environmental awareness and circular-friendliness. One example includes MIT Centre for Collective Intelligence initiative (www.climatecolab.org), which acts as an online makerspace allowing climate activists, scientists and experts to share knowledge and collaborate on solutions aiming to reduce global warming. Procter & Gamble embedded the environmental sustainability into its business strategy and allows crowds invent uses for both new and existing products and technologies (<https://us.pg.com/environmental-sustainability>).

4. BARRIERS AND DRIVERS IN BUILDING THE OCIE

A variety of studies provide the drivers and barriers for CE implementation and OI are closely linked. The factors influencing the implementation of a CE and OI, include legal barriers, such as IP rights, technology and resource prices, corporate strategy, user preferences and corporate culture (Pinheiro et al. 2019 ; Govindan and Hasanagic, 2018; Tura et. al, 2019). Many companies are still unexperienced in both circular innovation and multiple stakeholder engagement so implementing OCI approaches involves great uncertainties. The potential advantages of the OI make the issue of the adequate protection of IP one of the key challenges. Laursen and Salter (2014) confirm that there is a relationship between the degree of the openness of entire innovative processes implemented by enterprises and the use of formal instruments for the protection of IP (e.g. patents). Faced with the danger of losing control over key intellectual assets, most enterprises would be not willing to share their knowledge with other entities, without adequate guarantees in the form of legal safeguards (Hurmelinna-Laukkanen 2011). Individual and social barriers affecting the culture of knowledge sharing, mutual trust between the partners is another barrier. The problem sometimes called the “cultural wall“ (Abdelwhab Ali et al. 2019). As de Vries et al. (2006) noted, knowledge sharing behaviours greatly depend on one’s attitude – that person’s willingness to share knowledge. Kusa et al. (2021) consider motivational factors (social altruism, perception, prioritization, etc.) as decisive for an individuals' initiation and continuation of a sustainable business. Consequently, major barriers in building the successful OCIEs point to such problems as: stiff administrative and organisational structure, different values, insufficient incentives or motivation, lack of trust, cognitive distance and different communication channels; division of rights and management of IP.

5. CONCLUSION AND IMPLICATIONS

The OI and CI are somewhat overlapping concepts, both *combine the internal and external stakeholders in the joint innovation forces*. The degree of overlap of the two concepts OI and CI differ according to the type of industry, the size of the organization (start-ups, SMEs, multinational corporations) as well as the degree of openness of each stakeholder. Therefore building OCIE can significantly impact the speed of transition to the sustainable and CE model. Each OCIE may have different structure of interactions and types of collaboration, and so the different challenges and opportunities, yet its goal and rationale remains the same - to enable the flow of technology and information needed to turn a circular idea into a real process, product, or service. Hence, public policies should be oriented towards eliminating the potential physical and administrative barriers, and stimulating drivers in the transition to the OCIE. The literature on the OCIE concept is still very limited. Further empirical studies and academic discussion are needed in order to advance both, the underlying analytical as well as methodological framework behind the OCIE.

DECLARATIONS

Competing interests The author declares no competing interests.

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