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CIRCULAR ECONOMY

**THE COLLABORATION BETWEEN ESTABLISHED CORPORATIONS
AND**

START-UP COMPANIES IN CIRCULAR BUSINESS MODELLING

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1. Introduction

1.1 Positioning of the research and research question

The main object of the present research is understanding how big and small enterprises interact and what can be the contribution in terms of innovation that small enterprises bring to big ones, in terms of circularity within the business model. In such a sense, it is necessary to analyze the existing theoretical framework and related to the study of relations among firms and hypothesize its evolution in terms of circularity.

From the above mentioned concepts and theories summarized, a set of research questions arise, that have been at the core of the present research and have been developed in a set of research outcomes. These follows the idea that (Bigliardi and Filippelli, 2021) “circular economy and entrepreneurship are closely interlinked as, on one side, circular economy opens up a range of new business opportunities, while on the other side, entrepreneurs are crucial to implement circular business models (Veleva and Bodkin, 2018)”. These questions can be summarized as it follows:

- Can the concept of circularity be considered as an innovation in itself, and can therefore a company, which adopts a circular business model (start-up; small; medium, large), be considered innovative?
- Is it verified or verifiable that, due to its characteristics, an innovative start-up is able to develop a circular business model, and adapt to the changing market faster than a large business?
- Are there advantages for an innovative and circular start-up in collaborating with a large company, in terms, for example, of access to wider markets, corporate and institutional networks, and various and diversified financing instruments?
- Are there advantages for a large company in adopting circular business models, benefiting from collaborations with innovative circular start-ups?
- Can collaboration with circular start-ups accelerate, for a large company rooted in the market, the adoption of diversification strategies towards new

sustainable business models, thanks to the opening up to sectors different than the core one?

These questions are relevant in trying to understand if and in which terms circularity can become part of the business model and of an innovation process. In such sense, the terms and questions highlighted above have not been widely examined together. Therefore, both a literature review, a theoretical framework and a set of case studies will be investigated to check the effective application or applicability of circularity principles into the innovation process of large companies and small enterprises.

The ultimate objective of this research is to contribute to the existing body of knowledge surrounding collaborative dynamics between large corporations and start-up firms.

This is because there is a lack of a comprehensive framework of the literature related to the aforementioned topics. Furthermore, there is a lack of empirical evidence of the actual and potential collaboration between large and small companies on issues of innovation aimed at circularity, industrial symbiosis, and spillovers between small and large companies.

1.2 Expected contribution

This research aims to address recent calls for investigation into the positive correlations among various stakeholders' interests and perspectives, alongside the management of value within organizations (Barney, 2020; Bundy et al., 2018; Henisz et al., 2014). We enhanced understanding of this emerging research area that merges Stakeholder Theory (ST), Value-Based Systems (VBS) within the Value Capture Theory (VCT), the Business Model Innovation Theory (BMIT) and Organizational Governance (OG) and its results, as the Ecosystem of Innovation (EI), by elucidating how stakeholders' sources of influence shaped the distribution of value among them (Fung, 2006; Gomez and Korine, 2008; Klein et al., 2019). As a stride towards formulating a theory of stakeholder governance concerning value allocation, this conceptual framework established the groundwork for fresh

interpretations of governance within modern organizations seeking to acknowledge and accommodate the diverse primary stakeholders and their participatory authority, a facet that current governance frameworks inadequately captured.

In this context, the research aims to develop a conceptual synthesis of the different theories considered within a single framework, while also seeking to define the actual level of knowledge and awareness among companies regarding issues related to innovation, circularity, and collaboration between companies of different sizes on these topics, as well as to highlight 'virtuous' case studies that can provide examples to scale and replicate.

1.3 Research organization

The research aims to understand how collaboration between large companies and start-ups could be a win-win solution in fostering innovation and circularity in business models.

In particular, it was interesting to understand the concepts of circularity as innovation, examining the relation between innovation in start-up companies and the development of a circular business model, aimed at discovering the -

-advantages for start-up or small enterprises as well as the -advantages for large-sized companies, particularly in the direction of exploiting openness towards new market sectors resulting from partnerships.

In particular, the research was organized in the following major steps, to be exploited in the thesis' chapters in the Research outcome:

- A literature review on the main topics of the present research, including the state of the art on the circular business model, the role of the size of innovation of enterprises on the circular model, etc.

- Evaluation of the instruments and methods to be used in the research: database construction and analysis, questionnaires and interviews, etc.

- Selection of potential case studies for testing the approach observed through the literature review after a qualitative analysis of spin-offs, start-ups, and innovative firms.

1.4 Research outcome

The rapid evolution of the business landscape has prompted both large corporations and startups or small enterprises to seek innovative ways of collaborating and leveraging each other's strengths.

The realms of entrepreneurship and corporate enterprise have long existed as separate entities, each with its own unique characteristics and objectives. However, in recent years, a growing trend of collaboration between large corporations and startups has emerged, driven by the mutual benefits and synergies that such partnerships can create. This shift in dynamics has given rise to new opportunities, as well as challenges, for both parties involved.

We hereby provide an extended summary of forthcoming chapters that delve into the methodological framework and analysis of real-world case studies, shedding light on the collaborative endeavors between these two distinct entities.

The rest of the work is organized as it follows.

- 1) A review of the literature on the state of the art.

Chapter two represents the first outcome of the research and will consist of a literature review on the state of the art of the main three theories considered in the present research, as the Stakeholder Theory of the firm, the Value Capture Theory and the Business Model Innovation theory.

The literature review will be also the occasion to deepen the concept of 'circularity as innovation' as a key concept in the following development of the research.

This chapter will represent also the occasion to define a framework of major drivers and characteristics to be searched in companies in order to define them as innovative in the circular business model approach. Such characteristics will represent the starting point for the definition of the

questionnaires to be implemented in the following two steps of the research.

- 2) The third chapter is dedicated to exploring the level of awareness and engagement that companies have with the Circular Economy. Specifically, it seeks to assess how familiar these companies are with the principles of the Circular Economy, the extent to which they have integrated Circular Economy initiatives into their business practices, and the degree to which these initiatives are developed in collaboration with other organizations. To gain these insights, a comprehensive survey is conducted, combining both questionnaires and semi-structured interviews. The companies participating in this research are primarily based in the Friuli Venezia Giulia region, though the sample also includes firms that maintain collaborative relationships with the University of Trieste, as well as spin-offs originating from the University.

Given that these companies typically collaborate with the University, they are generally predisposed to embrace innovation and explore new approaches, particularly in areas like sustainability and circular business models. This chapter offers valuable insights into how academic partnerships and a culture of innovation drive the adoption of sustainable practices within businesses.

- 3) A qualitative paper Alisea Case study

This chapter represents the final outcome and will be based on a qualitative analysis on a small enterprise that appeared interesting as the best case study to confirm the original hypothesis and research questions of circularly and industrial symbiosis within a innovative business model involving both large companies and smaller ones. The company resulted as an outcome from the previous chapter analysis.

The Alisea Company (Alisea S.r.l.) is situated in the industrial district of Veneto, and its flagship product, the "matita perpetua," exemplifies the company's integration of Industrial Symbiosis (IS) and Circular Economy (CE) principles in its production processes. Alisea Recycled and Reused Objects Design, based in Northern Italy, specializes in providing B2B

gadgets and promotional items with a core mission of transforming waste into valuable products. The case study is analysed combining ad-hoc questionnaires / interviews, analysis on the business data and processes, as well as an overview of the innovation dynamic framework of the company.

2 Literature Review on the state of the art of business model, from linear to circular economy , circular business, business model innovation and circular ecosystem

2.1 Abstract

The study carried on in this chapter is aimed at investigating the relationships between small entrepreneurial companies and large corporations in relation to the execution of circular and sustainable strategies. In particular in the present chapter we conducted a literature review using a descriptive method to understand the levels of interaction between small and large companies and how these interactions can influence business models within the context of the circular economy. The primary goal was to explore how circular ecosystems, a growing phenomenon involving autonomous but interdependent actors, contribute to the creation and delivery of a coherent circular value proposition. The literature on circular ecosystems often presents conflicting and imprecise descriptions, with a proliferation of definitions that complicates the accumulation of shared knowledge.

Through a systematic literature review, we analyzed the evolution of research over time and proposed a framework that synthesizes five key elements of a circular ecosystem: (1) value, (2) actors, (3) data, materials, and flows, (4) circular activities and strategies, and (5) governance. The findings reveal that a value proposition allowing for multiple cycles of value, such as activities that ensure materials are continuously returned to the industrial system, is critical for the success of these ecosystems. Additionally, the balance between the various actors, whether small or large companies, is essential to ensure that circular activities are effectively performed.

This study provides an overview of the organizational mechanisms of circular ecosystems and highlights the importance of collaboration between companies

of different sizes in supporting business models that promote the circular economy.

2.2 Introduction

In the upcoming sections, we will delve into the theoretical and methodological underpinnings of this collaborative landscape, aiming to provide a comprehensive understanding of the forces at play. By examining various models and frameworks, we will shed light on the mechanisms that drive successful partnerships between large corporations and startups.

The following paragraphs will present an in-depth examination of the methodological framework and empirical evidence related to the collaboration between large corporations and startups. By exploring a range of industries and analyzing case studies, we will highlight the opportunities, challenges, and best practices associated with such partnerships, in order to present a comprehensive overview for understanding and advancing collaborative dynamics in the ever-evolving business landscape.

This research framework is grounded on three theoretical frameworks: the stakeholder theory of the firm (Freeman, 1984), the value capture theory (Lepak et al., 2007) and the business model innovation theory (Skarzynski & Gibson; 2008). The current business trends are to work in the platform.

The rest of the chapter is organized as follows. Paragraph 2.3 presents some materials on overview of concepts related to the relevance of environmental values in final products. Paragraph 2.4 introduces the method adopted for the analysis. Paragraph 2.5 provides the literature review on the three main theories studied within the research, while paragraph 2.6 hosts the findings, followed by paragraph 2.7 where the results and discussion are observed. The chapter's conclusions are provided in paragraph 2.8.

2.3 Materials.

The concept of considering environmental value as high-end goods is rooted in the recognition of the intrinsic worth and significance of the environment. Here

are a few reasons why we can view environmental value as high-end goods (Shuong et al., 2021):

1. **Rarity and Scarcity:** High-end goods are often characterized by their rarity and limited availability. Similarly, the environment and its resources, such as pristine ecosystems, clean air, and biodiversity, are increasingly becoming scarce and limited. Recognizing their value highlights their uniqueness and the need to protect and preserve them. (Ellen MacArthur Foundation, E., 2013).

2. **Desirability and Exclusivity:** High-end goods are sought after due to their desirability and exclusivity. The environmental value is desirable because it contributes to the overall well-being of humanity and the planet. People recognize the benefits and importance of clean air, unpolluted water, and a healthy environment, making them highly valued and exclusive in their own right (Veleva, Bodkin, 2018).

3. **Economic and Social Impact:** High-end goods often have a significant economic and social impact. Similarly, the environment has far-reaching effects on economies, communities, and individuals. Environmental degradation can lead to negative consequences such as health issues, reduced productivity, and increased costs. Conversely, preserving and investing in the environment can create positive impacts, including sustainable economic growth, improved quality of life, and enhanced social well-being (Bigliardi, Filippelli, 2021).

4. **Long-term Investment:** High-end goods are often viewed as long-term investments that retain or increase their value over time. The environment also represents a long-term investment as it supports the sustainability and resilience of ecosystems, which are essential for future generations. Recognizing environmental value as high-end goods emphasizes the need for long-term planning, conservation efforts, and sustainable practices to ensure their preservation and continued benefits (Harrison, Bosse, & Phillips, 2010).

By considering environmental value as high-end goods, we elevate the importance of protecting and valuing the environment as a valuable and essential asset for current and future generations.

The concept of the Circular Economy is gaining traction across academia, industry, and policymaking circles as a viable model aimed at reducing resource depletion, waste, and emissions. Its implementation within organizations heavily depends on leveraging business models. A considerable body of literature has surfaced, delving into the concepts of circular business models and circular business model innovation. Nonetheless, there exists a notable lack of clarity regarding their theoretical underpinnings. To bridge this gap and organize the current understanding of the emerging field concerning circular business models and circular business model innovation, we undertook a literature review employing systematic database searches and cross-reference snowballing techniques (Harrison, Bosse, & Phillips, 2010).

2.4 Methods

In this study, we adopted a narrative literature review approach to synthesize the existing body of knowledge on "business model", "from linear to circular", "business model innovation", "circular business", and "circular ecosystem". The narrative review, recognized as the "traditional" method for reviewing literature, provides a qualitative interpretation of previous research (Sylvester et al., 2013). Its purpose is to summarize the main findings on "business model", "from linear to circular", "business model innovation", "circular business", and "circular ecosystem", allowing for a more flexible and comprehensive exploration of prior work (Davies, 2000; Green et al., 2006). This type of review is particularly useful for offering a background understanding of the subject and for identifying gaps, inconsistencies, or opportunities for future research (Cronin et al., 2008).

1) Literature Search and Selection Process

The narrative review process we followed consisted of three primary phases: i) literature search and screening, ii) data extraction and analysis, and iii) writing the literature review, as suggested by Levy and Ellis (2006). We undertook a broad search of academic databases, including Scopus and Scholar, using a range of keywords and search terms related to "business model", "from linear to circular", "business model innovation", "circular business", and "circular

ecosystem". Articles were selected based on their relevance to the research objectives, focusing primarily on peer-reviewed journal articles, conference proceedings, and key books in the field. Although this approach lacks the explicit inclusion criteria found in systematic reviews, we made an effort to select literature that provided diverse perspectives and deep insights into the topic under investigation (Baumeister & Leary, 1997).

2) Data Extraction and Synthesis

The data extraction process involved reviewing and categorizing the selected studies according to their key contributions, methodologies, and theoretical frameworks. As with many narrative reviews, there was a degree of subjectivity involved in selecting which studies to emphasize, and some less relevant studies were excluded to maintain focus on the main objectives of the review (Baumeister & Leary, 1997; Green et al., 2006). This approach, however, allowed us to construct a coherent narrative that highlights the most significant findings in the literature. In line with vom Brocke et al. (2009), we structured our synthesis around key themes that emerged from the literature, organizing the review to present a clear and cohesive summary of existing knowledge.

3) Writing and Presentation of Findings

The final step, writing the literature review, followed the guidelines proposed by Bandara, Miskon, and Fielt (2011), ensuring a structured and systematic presentation of findings. In this phase, we synthesized the extracted data to highlight the evolution of research in the field, key theoretical contributions, and practical implications. By following a structured approach, we aimed to reduce some of the potential biases typically associated with narrative reviews, while still benefiting from the flexibility and breadth that this method offers.

4) Advantages of the Narrative Approach

Despite the criticisms of being less rigorous than systematic reviews, the narrative review method was well-suited to our research objectives. It enabled us to gather a broad range of literature on the topic and synthesize it in a way that provides readers with a comprehensive understanding of the current state of knowledge. Furthermore, the narrative review helped identify important research

gaps and inconsistencies, which offer potential avenues for future investigation (Green et al., 2006). As Cronin et al. (2008) noted, narrative reviews are particularly useful for providing a detailed background on a subject, making them ideal for researchers and practitioners alike.

In conclusion, by adhering to established frameworks for conducting narrative reviews (Levy & Ellis, 2006; vom Brocke et al., 2009; Bandara, Miskon, & Fieft, 2011), we aimed to maintain a balance between flexibility and methodological rigor. This approach allowed us to present a thorough and insightful review of the literature on [specific topic], while also contributing to the growing body of knowledge in this area.

2.4.1 Literature Search and Selection Process

We identified a set of keywords, including the main three theoretical frameworks: the “stakeholder theory of the firm” (Freeman, 1984), the “value capture theory” (Lepak et al., 2007) and the “business model innovation theory” (Skarzynski & Gibson, 2008). Ancillary keywords involved "business model", "from linear to circular", "business model innovation", "circular business", and "circular ecosystem", and we conducted a targeted search to select relevant articles for our review. These keywords were chosen to capture the core themes of our research, enabling us to focus on the transition from traditional, linear business models to those based on circular economy principles, as well as the innovations that drive this shift.

To ensure the comprehensiveness of our search, we applied these keywords across multiple academic databases, such as Scopus, Google Scholar, ensuring a wide coverage of both seminal works and recent advancements in the field. The selection process prioritized articles that directly addressed the evolution of business models in the context of circular economy and sustainability, as well as those that discussed the interplay between business model innovation and the broader circular ecosystem.

Papers were chosen based on their relevance to the research objectives, methodological rigor, and their contribution to advancing understanding of how

businesses are transitioning towards circular practices. This structured approach allowed us to compile a dataset that reflects a diverse array of perspectives, methodologies, and insights on the topic. The specific selection criteria and analysis methods are detailed in the following sections, providing a transparent account of how the literature was gathered and synthesized for this review.

By applying these keywords strategically, we ensured that the review captured the most relevant and impactful studies, thus offering a comprehensive overview of the current knowledge on the transformation from linear to circular business models and the role of innovation in fostering circular ecosystems.

2.4.2 Data Extraction and Synthesis

In this study, data extraction was conducted by performing a comprehensive search on major academic platforms such as Scopus, Google Scholar, and others popular databases and platforms (i.e., Scopus, Scholar, researchgate; etc.). We carefully selected relevant literature by utilizing a set of well-defined keywords that aligned with the core themes of our research, including "circular economy," "circular business model," and "business model innovation." These keywords were chosen to ensure a broad yet focused retrieval of articles that addressed the intersection of innovation and sustainability within business practices.

The search strategy aimed to capture a wide array of sources, from peer-reviewed journal articles to conference papers and significant book chapters, providing a holistic view of the current state of knowledge on the topics under investigation. In addition to keyword-based searches, we employed citation tracking and backward and forward snowballing techniques to identify additional relevant literature. This method allowed us to expand the initial pool of references by examining the sources cited in key papers (backward snowballing) and identifying subsequent papers that cited the key articles (forward snowballing). These techniques helped ensure that the literature review was as exhaustive as possible, incorporating both foundational and cutting-edge research in the field. To maintain rigor and relevance in the data extraction process, inclusion and exclusion criteria were applied. We prioritized studies published within the last 10 years to capture recent developments in the field, though seminal works were

also included to provide essential theoretical context. Nonetheless, we performed a deep analysis on less recent literature and 'classic' papers in order to correctly root the research into an established and consolidated research framework. Articles were selected based on their contribution to understanding the relationship between circular economy principles and business model innovation, with a focus on practical applications in real-world business settings. This approach enabled us to build a robust dataset for analysis, providing a comprehensive foundation for exploring the role of circular business models in fostering sustainable innovation.

Moreover, the selection criteria extended beyond relevance to the topic; we also considered the methodological quality of the studies, favoring those that employed rigorous quantitative or qualitative research methods. This ensured that the literature we synthesized was not only relevant but also reliable and grounded in solid empirical evidence. By combining a targeted keyword search with advanced retrieval techniques and stringent selection criteria, our data extraction process provided a thorough and well-rounded basis for the subsequent analysis of circular economy practices and their implications for business model innovation.

This structured approach to data extraction was critical in ensuring that the review captured the breadth and depth of research in this emerging area, while also filtering out studies that lacked rigor or direct relevance to our research questions. As a result, the final body of literature synthesized in this review offers a detailed and nuanced understanding of how businesses are integrating circular economy principles into their innovation strategies.

2.5 Three theories: Stakeholder Theory, the Value Capture

Theory, the Business Model Innovation Theory

2.5.1 The stakeholder theory

Stakeholder theory posits that enhancing the performance of a product or service can be achieved by considering the interrelations between a business and the various groups and individuals who can impact or are impacted by it.

Primarily, from a stakeholder perspective, a business can be construed as a network of relationships among groups with vested interests in the business activities (Freeman, 1984; Jones, 1995; Walsh, 2022). It involves the interactions among customers, suppliers, employees, financiers (such as stockholders, bondholders, banks, etc.), communities, and managers, aimed at collectively creating and exchanging value. Understanding a business entails comprehending how these relationships function and evolve over time. It falls upon executives to manage and mold these relationships to generate maximum value for stakeholders and oversee the equitable distribution of that value (Freeman, 1984). In cases where stakeholder interests diverge, executives must rethink problems to address the needs of a broad array of stakeholders, potentially leading to the creation of even more value for each party involved (Harrison, Bosse, & Phillips, 2010). If tradeoffs become necessary, executives must strategize on how to navigate these tradeoffs and work towards enhancing them for all parties (Freeman, Harrison, & Wicks, 2007).

Secondly, while effective management of stakeholder relationships aids businesses in surviving and thriving within capitalist systems, it also represents a moral endeavor involving questions of values, choices, and potential benefits or harms for numerous groups and individuals (Phillips, 2003).

Lastly, an approach to management that emphasizes the creation, maintenance, and alignment of stakeholder relationships better enables practitioners to generate value and mitigate moral shortcomings (Post, Preston, & Sachs, 2002a; Sisodia, Wolfe, & Sheth, 2007).

2.5.2 The value capture theory

The term "value" remains somewhat elusive within the realms of social science and Strategic Management studies (Dobb 1973; Ramirez, 1999). However, "value added" is comparatively less ambiguous. For instance, Kay (1995) defines "value added" as "the difference between the value of a firm's output and the (comprehensively accounted) cost of the firm's inputs" (1995: 19). He underscores "value added" as "the key measure of corporate success" (1995:

19). While "value added" is explicated in terms of value, the latter remains undefined. More recently, Bowman and Ambrosini (2000) build upon earlier contributions to explore the concept of value, its various types (like "use value" and "exchange value"), and value theories (such as "marginal utility" and "cost of production"), yet they do not offer a distinct definition of "value." Makadok and Coff (2002) critically evaluate a debate on value within the Resource-based View (RBV) context involving Bowman and Ambrosini (2000), Priem (2001), Priem and Butler (2001a,b), and Makadok (2001). They note that much of the RBV literature (e.g., Barney 1986; Collis and Montgomery 1995; Peteraf 1993) focuses on value capture rather than value creation. They argue that value creation necessitates a theory of consumer utility, a component absent from the RBV but present in marketing literature, thus not a separate concern for RBV scholars.

In contemporary discourse, "value creation" emerges as a central theme in management and organizational literature, yet it remains "not well understood" (Lepak et al, 2007: 180). Lepak et al. (2007: 182) propose that "value creation depends on the relative amount of value that is subjectively realized by a target user (or buyer) who is the focus of value creation." They delve into the process of value creation and the mechanisms facilitating the capture of created value.

Arguably, capturing value from perceived value-creating advantages, assets, and actions stands as the primary objective of firms (Brandenburger, Nalebuff 1995; Teece 1986; Teece et al, 1997; Pitelis, Teece 2009). Assuming a firm possesses an advantageous position from which it anticipates profits, the pivotal question becomes how to maximize the net present value (NPV) of future income streams derived from this advantage. Moreover, firms must consider how to capture the maximum value created by other firms and the broader economy—a critical aspect of competition (Brandenburger, Stuart 1996, 2007; MacDonald and Ryall 2004). Through market power, strategic planning, creativity, innovation, and serendipity, firms strive to surpass competitors in capturing value. Generally, firms may capture less, equal, or more value than they create through their activities (Brandenburger, Nalebuff 1995). The extent of the pie captured by a firm hinges on factors like barriers to entry (Bain 1956; Porter, 1980), firm-level "generic strategies" such as cost leadership, differentiation, and niche strategies

(Porter, 1985), integration, cooperation, diversification strategies (Penrose, 1959; Chandler, 1962; Williamson 1981; Teece, 1986), and firm-wide differentiation strategies.

2.5.3 From linear economy to circular economy

In today's global economy, there is a pressing challenge to swiftly transition towards new production and consumption patterns that promote more efficient resource utilization. This transition is commonly referred to as the "circular economy" (Circle Economy , 2018). The concept of the circular economy traces its roots back to Boulding's work in 1966, which advocated for perceiving the Earth as a desirable closed-loop system with finite assimilative capacity to achieve equilibrium between the economy and the environment. Stahel and Reday (1976) expanded on this concept, focusing on industrial economics and introducing the idea of a loop economy. This framework outlined strategies for waste prevention, regional job creation, resource efficiency, and the dematerialization of the industrial economy.

Stahel (1982) underscored the significance of promoting the utilization rather than the ownership of goods as a viable business model for a loop economy. This strategy enables industries to not only generate profits but also mitigate costs and risks associated with waste. The contemporary notion of a circular economy, as introduced by Pearce and Turner (1989), encompasses various elements and insights from diverse concepts all sharing the notion of closed loops. These encompass industrial ecology, cradle-to-cradle, laws of ecology, looped and performance economy, regenerative design, biomimicry, the blue economy, and life cycle management and engineering.

The Ellen MacArthur Foundation, with the support of McKinsey, has been instrumental in promoting and molding the present curated version of the circular economy concept through influential reports. Since 2013, there has been a growing academic interest in the concept, leading to various definitions. These

definitions emphasize the circular flow of materials, designing for restoration, and the goal of maintaining products, components, and materials at their peak utility and value.

Kirchherr et al. (2017) conducted a thorough review of numerous definitions and put forward a comprehensive one describing the circular economy as an economic system reliant on business models that substitute the "end-of-life" concept with the reduction, reuse, recycling, and recovery of materials. This system operates across various levels, encompassing the micro, meso, and macro levels, with the aim of attaining sustainable development and fostering environmental quality, economic prosperity, and social equity for both present and future generations.

Nonetheless, a prior review of the literature on the circular economy identified deficiencies in this definition, including an oversimplification of the term "end-of-life" and a limited focus on other lifecycle stages. Consequently, the authors revisited the definitions and modified a previous one for their research purposes. For this study, the circular economy is delineated as an economic system wherein resource input and waste, emissions, and energy leaks are minimized through cycling, extending lifespan, and maximizing value retention.

The aim of realizing a circular economy entails enhancing and reducing the material and energy loops. This goal can be achieved through diverse strategies, including digitalization, servitization, sharing solutions, designing durable products, adopting maintenance and repair practices, and advocating for reuse, remanufacturing, refurbishing, and recycling. While achieving a completely closed-loop system is theoretically unattainable, our conception of a circular economy embraces a dynamic viewpoint of "going circular," recognizing continual endeavors to minimize material and energy leakage rather than striving for a static state of complete circularity.

The transition from a linear economy to a circular one hinges, on one hand, on political leaders and their decisions, and on the other hand, on the behaviors of firms and consumers. Regarding the former, incorporating elements of circularity into their business models is essential (Kirchherr et al., 2017).

Our natural resources (energy, water, raw materials) are finite, and with a projected global population of 9 billion people by 2050, the current linear 'take-make-dispose' model is no longer sustainable (EMF, 2013). Recognizing that today's goods must become tomorrow's resources, the Ellen MacArthur Foundation conceptualizes and defines the circular economy as "an industrial system that is restorative or regenerative by intention and design" (EMF, 2015). At the core of the circular economy is the closed-loop concept, which aims to optimize the continuous flow of technical and biological materials within the value circle, while maintaining products, components, and materials at their highest utility and value at all times and minimizing waste (EMF, 2013).

While the circular economy is a contemporary movement, it is rooted in old ideas (Lewandowski, 2016). Currently, the relationship between the concepts of sustainability, bioeconomy, and circular economy remains underexplored (D'Amato et al., 2017; Geissdoerfer et al., 2018; Millar et al., 2019). The primary challenge in implementing a circular economy is that it necessitates systemic change (Yuan et al., 2006; EMF, 2015), requiring involvement from all actors within the value chains (suppliers, manufacturers, retailers, consumers). At the enterprise level, innovative business models are crucial, either by replacing existing ones or by offering new market opportunities for new products (EMF, 2013; Bocken et al., 2016; Lewandowski, 2016). Teece (2010: 183) underscores that "technological innovation by itself does not automatically guarantee business or economic success - far from it." Therefore, professionals and scholars are increasingly exploring how new sustainable business models can drive economic growth while mitigating negative impacts on the natural environment and society (Bocken et al., 2014; Stubbs, Cocklin, 2008; Boons, Lüdeke-Freund, 2013; Schaltegger et al., 2016).

The circular economy (CE) is recognized as a developmental strategy aimed at tackling environmental and economic challenges (Heshmati, 2015). Its primary goal is to disconnect the consumption of goods and services from the extraction of raw materials (Sauvé et al., 2016), thereby curbing waste generation and the depletion of natural resources (Lieder and Rashid, 2016). CE is widely perceived as a means to advance sustainable development (Kirchherr et al., 2017; Velenturf

and Purnell, 2021). The most accepted definition of CE, provided by the Ellen MacArthur Foundation (Geissdoerfer et al., 2017), characterizes it as "an industrial system that is restorative or regenerative by intention and design" (Ellen MacArthur Foundation, 2013: 7), with a focus on the principles of material, energy, and waste reduction, recovery, reuse, and recycling (Heshmati, 2015; Kirchherr et al., 2017).

The development of CE necessitated a multidisciplinary approach encompassing fields like ecology, design, economy, and business management, to transition from a linear economy. This transition facilitated the emergence of eco-innovations that prioritize ecological considerations over anthropocentric perspectives (Prieto-Sandoval et al., 2018). According to Prieto-Sandoval et al. (2018, p. 610), CE comprises four components: "1) the recirculation of resources, 2) a multilevel approach, 3) its significance for sustainable development, and 4) its close relationship with society. Al-Thani and Al-Ansari (2021: 1746) also underscore the fundamental role of circularity in CE, as discussions and definitions of CE commonly highlight the circular flow of materials, energy, and nutrients, emphasizing the broad range of applications and the significance of CE (Guo, 2018).

CE presents new business opportunities and encourages the adoption of innovative solutions for sustainable development (Veleva, Bodkin, 2018). For example, companies can devise business models that meet customer needs through product functionality rather than solely relying on the production and sale of physical goods (Tukker, 2015). This approach reduces material costs and boosts resource efficiency (Tukker, 2015). However, Jäger and Piscicelli (2021) propose that effective CE implementation requires organizations to establish numerous partnerships. These partnerships may entail collaborating with waste collection services for recycling purposes (Hsieh et al., 2017), managing the transportation, sorting, and dismantling of used materials (Tate et al., 2019), and mitigating risks and costs (Veleva, Bodkin, 2018).

One of the commonly used frameworks for circularity strategies is the 4R framework, which consists of four strategies: Reduce, Reuse, Recycle, and Recover. In this context, the authors suggest the addition of a fifth category,

Regenerate, to better accommodate startups involved in developing nature-based solutions. Nature-based solutions aim to enhance the utilization of ecosystem services, which encompass the benefits humans derive from ecosystems. Examples of ecosystem services include green roofs or walls and urban green spaces, which rely on minimal input of non-renewable natural resources and prioritize renewable natural processes.

The R-list establishes a hierarchical sequence for waste management techniques, with Regenerate being prioritized over Reduce, followed by others in descending order of circularity. These methods are applicable within the two material cycles inherent in the circular economy: the biological cycle, which involves the movement of food and biologically-based materials (such as cotton and wood) intended to return to the biosphere through processes like composting or anaerobic digestion, and the technical cycle, which deals with the movement of inorganic or synthetic materials.

Our consumption patterns exert unprecedented impacts on the natural environment (Stern, 2000). These consumption habits have led to a convergence of issues, including environmental degradation, pollution, climate change, social inequality, poverty, and the increasing demand for renewable energy sources. These factors necessitate a fresh approach to conducting business (Menon, Menon, 1997). Consequently, many companies are recognizing the importance of sustainable business practices, with firms like Interface Carpet, Unilever, Nike, and Starbucks integrating sustainability into the core of their brands (Hardcastle, 2013). This research examines the literature on sustainable consumer behavior change and presents a comprehensive psychological framework to assist researchers and practitioners in promoting sustainable behavior.

2.5.4 The business model innovation

In today's fiercely competitive landscape (e.g., Skarzynski & Gibson, 2008; Tidd & Bessant, 2009; Hult, 2012), companies across all sectors globally are confronted with ever-evolving market dynamics. These shifts compel companies to reevaluate their operational business models more frequently and

fundamentally. Relying solely on product innovation targeted at local markets is no longer adequate to sustain competitiveness and ensure survival, as competitors can swiftly replicate products, and global rivals often dominate local market segments.

Many companies exhibit a preference for incremental innovations that maintain their existing line of value propositions, leveraging similar technologies aimed at familiar target customer segments (e.g., Christensen, 1997). Consequently, factors like strategic momentum (Miller & Friesen, 1980, 1982), path dependency (Nelson & Winter, 1982), and prior knowledge tend to reinforce the status quo, discouraging companies from questioning or altering their business models.

Nevertheless, only a handful of companies possess such a robust competitive advantage, such as unique assets, intellectual property rights (IPR), or exclusive technologies, that they can forego radical business model innovation. In most industries, intense global competition (Skarzynski & Gibson, 2008; Tidd & Bessant, 2009; Hult, 2012) has not only shortened product/service life cycles but also accelerated the obsolescence of prevailing business models (e.g., IBM, 2006, 2008). Consequently, an increasing number of companies must reconsider their business models to sustain competitiveness in existing markets or penetrate new ones successfully (e.g., Chesbrough, 2007; Skarzynski & Gibson, 2008; Tidd & Bessant, 2009).

Well-known entities like Apple, IBM, Dell, Southwest Airlines, Ryanair, Google, Microsoft, Amazon, Facebook, Skype, Starbucks, Zara, and Cirque du Soleil epitomize what D'Aveni (1994: 2) terms "hypercompetitive firms." Their market success cannot be attributed solely to product or service innovations. Instead, the cornerstone of their achievements lies in business model innovation.

The notion of the business model surged in popularity and underwent evolution during the dot-com boom in the 1990s, notably with the emergence of innovative revenue mechanisms. Initially, the business model concept served as a conduit for conveying intricate business concepts to potential investors within constrained timeframes. Over time, it evolved into a tool for systemic analysis, planning, and communication, as well as a strategic asset for attaining competitive advantage and enhancing firm performance. The capacity to innovate and introduce

business models swiftly and effectively can confer a significant competitive edge for organizations, particularly given the diminishing returns on technology, rising complexity, and declining cost of capital. The disruption brought about by digital transformation further underscores the significance of business model innovation, as evidenced by the market valuation of relatively new technology conglomerates with innovative digital business models.

Business model innovation capabilities not only harbor the potential to yield superior returns compared to product or process innovations but can also serve as a "renewable" competitive advantage. These capabilities can engender a dynamic sustainable competitive advantage for companies, rendering them pivotal for organizational strategy. Furthermore, business model innovation plays a pivotal role in aiding organizations in achieving their social and environmental objectives by leveraging effective environmentally, socially, and economically sustainable technologies and solutions.

Enterprises engaging in sustainable business model innovation have the potential to enhance their financial, social, and environmental performance, as well as bolster their resilience and capacity to manage risks stemming from their operational environment. Academic research on business model innovation has also burgeoned, with numerous reviews and studies conducted on the subject. These encompass works by Bieger and Reinhold (2011), George and Bock (2011), Zott et al. (2011), Massa et al. (2017), Schallmo (2013), Spieth et al. (2014), Wirtz et al. (2016), Foss and Saebi (2017), and an extensive special issue in the journal *Long Range Planning* (2010, Volume 43, Issue 2-3). Consequently, various definitions of the concept have surfaced, as illustrated in Table 2. In this study, we embrace a prior definition proposed by the authors, derived from a comprehensive review of the field. Business model innovation is delineated as "the conceptualization and implementation of new business models that may involve the development of entirely novel models, the diversification into additional models, the acquisition of new models, or the transformation from one model to another. The transformation can encompass the entire business model or specific elements related to value proposition, value creation and delivery,

value capture, the interconnections between these elements, and the value network" (Geissdoerfer et al., 2018b).

Advancing concepts and theories of business models holds significance for delineating and categorizing businesses, for scholarly inquiry, and/or for formulating practical recommendations to aid managerial decision-making (Baden-Fuller and Morgan, 2010; Taran et al., 2015). To date, only a few propositions have been put forth regarding how to classify sustainable or circular business models (Lewandowski, 2016). For instance, the Ellen MacArthur Foundation (EMF, 2015) proposes the ReSOLVE framework, outlining various circular business strategies: 'regenerate, share, optimize, loop, virtualize, exchange'. Bocken et al. (2014) categorize sustainable business models into eight archetypes, which are further grouped into higher-order classifications, describing the primary types of business model innovation: technological, social, or organizational. Recently, Lüdeke-Freund et al. (2019) conducted a review and classification of circular business model patterns. Their study, based on a morphological analysis of 26 current cases from literature, identifies six major circular economy business model patterns: (1) repair and maintenance, (2) reuse and redistribution, (3) refurbishment and remanufacturing, (4) recycling, (5) cascading and repurposing, and (6) organic feedstock.

In particular, as noted in Bigliardi and Filippelli (2021), "Circular oriented innovation (COI) features among the emerging keywords, justified by the fact that it is a new and still under-investigated concept (Brown et al., 2019). It represents a new strand of research within the circular economy literature; specifically, it consists of the study of combinations of product design, business model, and value network configurations to implement circular economy strategies (Brown et al., 2021). The common goal of such strategies is to act on product obsolescence to preserve product characteristics for as long as possible or to restore their integrity, limiting the use of new resources and the disposal of obsolete goods (Ranta, 2018).

The traditional equilibrium between customers and suppliers has been disrupted by advancements in the global economy. The advent of new communication and computing technologies, along with the establishment of more open global

trading systems, has empowered customers with expanded choices. Diverse customer needs can now be articulated, and alternative supply options are more transparent. Consequently, businesses must prioritize a customer-centric approach, especially as technology enables cost-effective provision of information and customer solutions. These shifts necessitate a reassessment of the value propositions offered to customers, as the supply-driven logic of the industrial era is no longer sustainable in many sectors. This evolving landscape also underscores the importance of not only effectively addressing customer needs but also capturing value through the provision of new products and services. Without a well-defined business model, innovators will encounter challenges in delivering and extracting value from their innovations, particularly evident in Internet companies where revenue generation can be challenging due to customer expectations of free basic services.

A business model functions to articulate the rationale and provide evidence of how a business generates and delivers value to customers. It delineates the revenue, cost, and profit structure associated with delivering that value. Several elements must be considered when crafting a business model. Designing a sound business model entails addressing interconnected issues that lie at the heart of the fundamental question posed by business strategists: How can a sustainable competitive advantage be forged to achieve above-average profits? Essentially, a business model elucidates how an enterprise generates and delivers value to customers and translates received payments into profits. To capitalize on innovation, business trailblazers must excel not only in product innovation but also in crafting a business model that aligns with customer needs and technological trends. However, devising a successful business model alone does not guarantee a competitive advantage, as imitation is often straightforward. It is imperative to establish a differentiated yet effective and efficient business model that is challenging to replicate, thereby enhancing the likelihood of generating profits. Business model innovation itself can serve as a pathway to attaining a competitive advantage if the model is distinctive enough to deter replication by both established players and new entrants.

2.5.5 The Circular Economy and circular business models

According to Potting, the transition to a circular economy paradigm within firms encompasses three elements: material and product design, logistics, and business models (Potting et al., 2017). This study specifically delves into business models.

Existing business models possess limited transferability, and there lacks a comprehensive framework that caters to every type of company in designing a circular business model (Stewart et al., 2018). For an established firm, altering the design of its business model proves to be challenging. This is due to the stickiness effects exerted by existing resources, the path-dependency caused by capabilities and routines in use, and the sunk-costs effect from previous investments.

Many large companies have recently begun collaborating with smaller firms to integrate elements of circularity into their business models. Renault, Signify, H&M, and Adidas serve as notable examples of companies committed to incorporating circular economy elements into their business models through partnerships with smaller entities. For instance, Renault, in collaboration with a startup in which it holds a stake, has implemented a reverse supply chain to collect and remanufacture used spare parts for repairing automobiles currently in use. Signify, a startup of the Philips group (formerly Philips Lighting), has developed a light-as-a-service offering, where the company retains ownership of lights and luminaires while charging customers monthly fees for contracted illumination levels, as well as maintenance and upkeep of fixtures, including recycling and other end-of-life procedures. Fashion chain H&M collaborates with the online platform Sellpy to facilitate the sale of clothing items no longer used by consumers. Adidas has partnered with Parley for the Oceans since 2015 to manufacture shoes from recycled plastic ocean debris and has recently committed to using only recycled plastics in all its products by 2024.

Generally, established firms tend to adopt circular strategies situated at the bottom of the circularity hierarchy, such as recycling, and make marginal changes instead of transitioning to bolder strategies and genuinely circular business models. Recent research (Rood et al., 2019), based on an analysis of the 2016

corporate sustainability reports of 46 established firms, suggests that while the circular economy is being integrated into the corporate sustainability agenda, the focus remains on end-of-life management strategies, with less prevalence in the adoption of business models incorporating higher levels of circularity.

In contrast, as new market entrants, startups have the opportunity to immediately adopt strategies with higher degrees of circularity and monetize design-to-last and maintenance efforts. Embracing such strategies can be accomplished, for example, through a product service system (PSS) model, which involves a transition from selling a product to offering leasing and sharing services. Providing the use of washing machines, as exemplified by Bundles, represents a successful PSS model (Miller, Friesen, 1982).

Startups are incentivized to collaborate with large companies for two reasons: firstly, such collaboration fosters innovation in the business models of large companies, while simultaneously enabling startups to gain swift access to markets through the established company's organizational structure (Freeman, 1984). Secondly, collaboration between startups and large companies can facilitate small companies' access to financing, thereby aiding rapid growth and market positioning (Skarzynski & Gibson, 2008; Taaran, Lindberg, 2015; Tidd & Bessant, 2009; Hult, 2012).

2.6. Findings: Ecosystems and Platforms

The three theories above enunciated stakeholder theory, value capture theory and business model innovation at the very bottom of this research. New business models like “Ecosystems” and “Platforms”, A business ecosystem consists of interconnected entities, encompassing both organizations and individuals (Iansiti, Levien, 2004). These entities establish both cooperative and competitive relationships (Moore, 1993) while collaborating collectively to provide customers with valuable solutions (Adner, 2006; Iansiti and Levien, 2004; Moore, 1993). Dominate the scene in various industries. In ecosystems and in platforms there is no single subject who does all the work, but companies that tend to specialize and to create value jointly and they do that normally under the coordination of a bigger subject (Paulus-Rohmer et al, 2017). Value allocation processes occurs

among the various stakeholders participating to such systems. We need to come to a better understanding of the value allocation model and that is:

- i) what value to create and for whom
- ii) how to appropriate the created value over unintended value appropriators and
- iii) how to distribute the appropriate value among stakeholders (Harrison et al., 2020).

To include environmental value in the capture value theory, the stakeholder theory, and the business model innovation theory, several approaches can be considered (Dyck et al., 2018):

1. Capture Value Theory: In the context of environmental value, the capture value theory can be expanded to incorporate the concept of "green" or sustainable capture value. This involves recognizing and quantifying the positive environmental impacts generated by a business or project and incorporating them into the assessment of value creation. For example, companies can assess the value created through reduced carbon emissions, resource conservation, or biodiversity preservation.

2. Stakeholder Theory: Environmental value can be included in the stakeholder theory by identifying and engaging environmental stakeholders such as environmental organizations, local communities, and regulators. By considering their interests and concerns, businesses can develop strategies and initiatives that prioritize environmental sustainability. This may involve collaborating with stakeholders to develop environmentally responsible practices, setting specific environmental goals, and regularly reporting on progress.

3. Business Model Innovation Theory: Incorporating environmental value into the business model innovation theory requires rethinking and redesigning business models to integrate sustainability considerations. This can involve exploring new revenue streams related to environmental products or services, adopting circular economy principles, implementing green supply chain practices, or leveraging technology for environmental monitoring and optimization. The goal is to create

business models that not only generate economic value but also contribute to environmental sustainability.

Overall, including environmental value in these theories involves recognizing the importance of environmental considerations and integrating them into decision-making processes, performance metrics, and strategic planning. By doing so, businesses can align their operations with sustainable practices and create long-term value for both their stakeholders and the environment.

Before delving into the existing definitions, strengths, and limitations of a circular ecosystem, and subsequently developing an enhanced definition, it is necessary to explore the primary characteristics of business ecosystems. To achieve this, we refer to the evaluation of literature on business ecosystems. Although the authors in our analysis offer some insights into the key features of business ecosystems, we leverage the business ecosystem literature to enhance our understanding of what constitutes a circular ecosystem. This step is crucial in comprehending how business ecosystems can be connected with circular ecosystems. Subsequently, we narrow down our content analysis to discuss the conceptualizations of a circular ecosystem within our sample.

A business ecosystem comprises interconnected actors, including organizations and individuals (Iansiti and Levien, 2004). These actors establish cooperative and competitive relationships (Moore, 1993) and collectively work towards delivering a valuable solution to customers (Adner, 2006; Iansiti and Levien, 2004; Moore, 1993). Recent studies have introduced additional characteristics of ecosystems, such as a multilateral interdependence structure (Adner, 2017; Adner, Kapoor, 2010) and complementarity (Jacobides et al., 2018). The interdependence structure implies that actors within the ecosystem exchange components and materials (Ganco et al., 2020; Thomas, Autio, 2020). Multilateralism suggests that actors establish relationships beyond bilateral connections, extending to multiple actors (Adner, 2017). Complementarity refers to the unique or super modular relationships between actors (Jacobides et al., 2018).

Applying a business ecosystem framework to a circular economy (CE) context is not an automatic process and necessitates the establishment of theoretical

connections. For instance, researchers in the field of circular economy argue that for a system to be considered circular, it must be restorative and regenerative (Ellen Macarthur Foundation, 2013), close the material cycle (Kirchherr et al., 2017), and adopt a win-win approach (Homrich et al., 2017) that minimizes the waste of energy and resources through activities like recycling, repair, remanufacturing, and reuse, among others (Geissdoerfer et al., 2017). Consequently, it is necessary to reconsider and elaborate on the main characteristics of business ecosystems that are relevant to circular ecosystems, as well as identify the unique characteristics of circular ecosystems.

Within the reviewed sample, only two definitions of a circular ecosystem have been identified (Aminoff et al., 2017; Wurster et al., 2020). Aminoff et al. (2017: 530) define a circular economy ecosystem as "co-evolving, dynamic and potentially self-organizing configurations (Vargo, Lusch, 2011), in which actors integrate resources and co-create circular value flows in interaction with each other. Wurster et al. (2020) integrate the concepts of a circular economy and innovation ecosystem and conceptualize it as "the evolving set(s) of actors, activities, and artifacts, and the institutions and relations that are important for the innovative performance within a circular economy.

These definitions address important aspects such as the need for value co-creation and the dynamic nature of an ecosystem. However, they do not consider characteristics such as interdependence between actors (a significant feature of ecosystems) and heterogeneity. These definitions fail to encompass important features of ecosystems in the context of a circular economy. A circular ecosystem is more than just the combination of a business ecosystem and a circular economy; it is a unique phenomenon. According to Konietzko et al. (2020), "an ecosystem perspective on a circular economy is both necessary and useful for firms to capture circularity as a systemic property."

When discussing circular ecosystems, scholars have often applied the theoretical lens of the business ecosystem (Adner, 2006; Moore, 1993). For instance, Tate et al. (2019) propose principles to transform existing ecosystems into circular ecosystems, while Konietzko et al. (2020a) identify a set of principles for

innovation in circular-based ecosystems. These studies demonstrate that the business ecosystem framework holds promise in examining the circular economy phenomenon. However, these studies also indicate the need for further development in integrating the concepts of the business ecosystem and circular economy. Additionally, the proliferation of terminologies related to circular ecosystems, without clear conceptualizations, hinders the development of a robust literature. Some studies use terms like "CE ecosystem" (Narayan and Tidström, 2020) or "circular ecosystem innovation" (Konietzko et al., 2020a, 2020b), while others employ "circular business ecosystem" (Bertassini et al., 2021). This terminological proliferation can lead to divergence and fragmentation. Therefore, a closer examination of circular ecosystems is necessary (Hsieh et al., 2017).

Certain studies refer to a circular ecosystem without providing a clear definition or characterizing the unit of analysis (Konietzko et al., 2020a; Whicher et al., 2018). Other studies provide definitions (Aminoff et al., 2017; Wurster et al., 2020), but they overlook several essential elements of ecosystem theory. For example, these articles fail to mention the presence of heterogeneous actors with interdependent and multilateral relationships, making their definitions similar to other theoretical constructs such as supply chains. Furthermore, current concepts do not emphasize the fact that actors play different roles in realizing the circular value proposition. Finally, these papers focus on actors or orchestrators rather than highlighting the centrality of the value proposition or innovation within the ecosystem. The lack of a clear definition may lead to difficulties in identifying the phenomenon of a circular ecosystem within the research field. It may also hinder the accumulation of knowledge by making it challenging to compare distinct phenomena and impede the growth of a more integrated field of research. Therefore, based on our understanding and the previous discussions, we define a circular ecosystem as a system of interdependent and heterogeneous actors that go beyond industrial boundaries and collectively direct their efforts towards a circular value proposition, providing opportunities for economic and environmental sustainability. In this definition, we acknowledge the concept of (Moore, 1993), which emphasizes the interactions among a community of actors

working towards a marketable solution. We specifically highlight the value proposition and ecosystem output, as emphasized by Adner (2017) and Thomas and Autio (2020). In our definition, we do not impose geographic boundaries on the ecosystem, as all the essential actors involved in making the value proposition tangible (Adner, 2017) can be part of the ecosystem regardless of their location. Moreover, we emphasize the primary interests driving a circular economy, such as financial and environmental advantages (Geissdoerfer et al., 2017). This definition serves as a crucial step in understanding previous and future research while establishing a common language. However, although necessary, this definition falls short in capturing the distinctive features of a circular ecosystem. We also address the unique elements that differentiate a circular ecosystem from others, as increasing understanding in these aspects is essential.

2.7. Results and Discussion

Thus far, we have discussed the evolution of studies integrating concepts from the circular economy (CE) and business ecosystems (BE) and have provided an appropriate definition. In this section, we will synthesize the elements of a circular ecosystem identified in the literature (Trevisan et al., 2022) and presents a framework for integrating the above mentioned theories into a model of circular economy – innovative business model. The elements identified are as follows: 1. Value, 2. Actors, 3. Data, Materials and Flows, 4. Circular Activities and Strategies, and 5. Governance. Let us describe each element in detail. These elements are tackled in terms of their definition and according to the possible set of elements of circularity in which they can be tackled (Table 1).

Table 1. Conceptual framework for a circular ecosystem

Elements	Description/Definition	Circularity - key aspects
Value	circular value proposition, value co-creation, collective value capture, and multiple circles of value	
Actors	organizations and individuals that participate in value co-creation and collective value capture	<ol style="list-style-type: none"> 1. Heterogeneity... 2. Alignment of interests 3. Defining the roles and responsibilities 4. Reliability among business partners 5. An appropriate balance... 6. Circular ecosystems necessitate the presence of an orchestrator ...
Data, Materials and Flows	information, resources, and material flows within the circular ecosystem	
Circular Activities & Strategies	activities and strategies implemented within the circular ecosystem	<ol style="list-style-type: none"> 1. Multiple activities... 2. considering the network of actors... 3. economic and environmental benefits
Governance	rules, policies, and mechanisms that govern the functioning of the circular ecosystem	supports coordination and the sharing of value among actors

Source: elaboration from Parida, Burström, Visnjic, Wincent, J. (2019).

With reference to Table 1 contents, the elements can be more broadly described as in the following lines.

Value: Among all the elements, value is the most critical concept in a circular ecosystem. This element encompasses a circular value proposition, value co-creation, collective value capture, and multiple circles of value. A circular value

proposition, collectively materialized, aligns and guides the activities of the various actors within the ecosystem. While scholars have noted that a focal value proposition is a central feature of a business ecosystem, the distinct characteristic of a circular ecosystem's value proposition lies in its circularity. Our review demonstrates that achieving environmental sustainability requires actors to establish systemic goals (Konietzko et al., 2020a) and engage in collaborative value co-creation (Aminoff et al., 2017). However, it is the continuous and collective value capture that ensures the overall health of the ecosystem. For instance, the Spring Pool Glass recycling ecosystem transforms recycled glass into various products, which are then commercialized within the ecosystem and external markets (Hsieh et al., 2017). Collective and fair value capture is crucial for maintaining the commitment and engagement of ecosystem members (Konietzko et al., 2020a; Stewart et al., 2018). This engagement leads to the emergence of multiple circles of value, which require more structured collaborative configurations than a traditional linear industrial system (Aminoff et al., 2017). **Actors:** The actors within a circular ecosystem include organizations and individuals that participate in value co-creation and collective value capture. These actors can represent diverse stakeholders, such as producers, consumers, suppliers, recyclers, policymakers, and community members. Collaboration and interdependence among actors are crucial in achieving circular objectives.

Data, Materials, and Flows: This element focuses on the information, resources, and material flows within the circular ecosystem. It encompasses data collection, analysis, and sharing, as well as the efficient utilization of materials and resources. The circular ecosystem aims to optimize resource flows, minimize waste, and enable circular material loops through practices like recycling, remanufacturing, and reuse.

Circular Activities and Strategies: This element encompasses the various activities and strategies implemented within the circular ecosystem. It includes practices such as product design for circularity, eco-design, resource recovery, reverse logistics, and the adoption of circular business models. The circular

activities and strategies aim to drive the transition towards a circular economy by integrating sustainable practices into the ecosystem (Kanda, Geissdoerfer, Hjelm, 2021).

Governance: The governance element focuses on the rules, policies, and mechanisms that govern the functioning of the circular ecosystem. It involves establishing mechanisms for decision-making, collaboration, and coordination among actors. Effective governance ensures the alignment of interests, fosters trust, and enables the implementation of circular practices and policies.

By understanding and addressing these five elements, a comprehensive framework for analyzing and designing circular ecosystems can be developed, leading to a deeper understanding of their dynamics and enabling more effective interventions and policies.

Actors: In a circular ecosystem, a group of actors is interconnected to develop and commercialize marketable innovations (Konietzko et al., 2020a). Achieving a circular solution requires a joint effort towards a shared circular purpose. Our study identifies six key aspects that require careful analysis when addressing circular ecosystems.

1. Heterogeneity and interdependence play a crucial role. The presence of diverse actors with complementary capabilities facilitates problem-solving within the ecosystem (Tate et al., 2019). Managing these complementarities is essential. Additionally, a structure of interdependence among actors can help reduce conflicts (Yest, Parida et al., 2019).
2. Alignment of interests is vital. Individual and collective interests must align within the ecosystem to achieve circular goals (Konietzko et al., 2020a).
3. Defining the roles and responsibilities of each actor is important. This aspect supports the assessment of ecosystem members (Parida et al., 2019). In a business ecosystem, actors are often categorized into four main roles: producer, consumer, scavenger, and decomposer (Tate et al., 2019).

4. Reliability among business partners is essential. Lack of trust can hinder the entry of new actors and hinder information sharing (Hakanen and Rajala, 2018).
5. An appropriate balance is required. In addition to heterogeneity, the ecosystem needs a sufficient number of actors to facilitate resource circularity (Tate et al., 2019).
6. Circular ecosystems necessitate the presence of an orchestrator. In our sample, the orchestrator is often a private company (e.g., Hakanen and Rajala, 2018; Parida et al., 2019) or a public institution (e.g., Langen et al., 2020) responsible for coordinating and supporting the activities of other players (Press et al., 2019; Hsieh et al., 2017). Our analysis highlights the crucial role of this keystone actor in providing infrastructure (Langen et al., 2020), protecting smaller companies (Hsieh et al., 2017), and ensuring the implementation of circular principles (Parida et al., 2019). The orchestrator may need to restructure its business model in a circular ecosystem. For example, Langen et al. (2020) conducted a fascinating study on the Port of Amsterdam, which shifted its business model towards a more service-oriented perspective. Furthermore, the orchestrator should establish legitimacy associated with circular initiatives (Press et al., 2019). Legitimacy strengthens the orchestrator's relations with stakeholders (Hsieh et al., 2017), fosters collaboration, project development, and corporate sustainability (Press et al., 2019). We also suggest that the orchestrator assesses the ecosystem at two key moments: during ecosystem creation and when the ecosystem is already established.

In order to structure a circular ecosystem, Konietzko et al. (2020a) propose the testing of a minimum viable ecosystem, which can offer valuable insights into potential risks and dependencies among actors. Assessing the existing ecosystem enables the orchestrator to analyze the roles and responsibilities of the players and identify potential opportunities for the entry of new actors (Parida et al., 2019). While actors are present in both business ecosystems and circular ecosystems, it is important to recognize that in circular ecosystems, these actors assume distinct roles specifically related to resource circularity.

Circular activities and strategies: This element emphasizes that in addition to having a circular value proposition, the activities performed by actors within the ecosystem should be environmentally oriented towards sustainability. Our findings suggest that ecosystem members can adopt circular strategies, such as recycling, and the activities required to implement these strategies go beyond those necessary to materialize the value proposition. Within this element, three key aspects are incorporated.

1. Multiple activities can be conducted in different domains. For instance, in the MaterialCo ecosystem examined by Hakanen and Rajala (2018), activities are focused on optimizing manufacturing processes (process-oriented), enhancing steel recycling (product-oriented), and facilitating the provision of data to other network participants (service-oriented).
2. When considering the network of actors, it is crucial to focus on strategies that have collective purposes. Establishing a common vision and goals to be achieved jointly is one of the fundamental principles for innovation in circular ecosystems (Konietzko et al., 2020a).
3. These strategies should yield economic and environmental benefits. The ecosystem must offer financial returns to remain healthy. If environmental impacts were integrated into operating costs, actors would be more motivated to improve the overall network. Consequently, there would be a heightened perception of the environmental and financial returns resulting from the implementation of circular strategies (Stewart et al., 2018).

Governance: The final element is governance, which supports coordination and the sharing of value among actors (Aminoff et al., 2017), a crucial factor for the success of business ecosystems. However, the governance in circular ecosystems has unique nuances (Hoffman Trevisan et al 2021). The governance should be non-hierarchical and collaborative (Hoffman Trevisan et al 2021). Participants in the circular ecosystem described by Konietzko et al. (2020a) emphasize the importance of being treated equally without a hierarchical division of power. Unlike traditional supply chains, circular ecosystems are characterized by greater independence and hierarchical flexibility among actors, implying that

actors have relative autonomy in their decision-making (Langen et al., 2020). However, in order to ensure coordination among the essential activities that make the value proposition tangible, scholars of business ecosystems (Jacobides et al., 2018) suggest the establishment of a set of rules and standards to be followed by ecosystem members. These rules can be established by government agencies (e.g., legislation imposed on waste recycling) (Hsieh et al., 2017) or by the ecosystem orchestrator who negotiates individually with other players (Parida et al., 2019). Particularly in circular ecosystems, the government plays an important role in establishing environmental laws.

2.8 Conclusions

The findings from the research reveal a clear progression in the literature, starting with the conceptualization that a business model can evolve into a circular business model, and ultimately leading to the creation of comprehensive innovation ecosystems. This evolution reflects the shift from traditional linear business models, which focus on resource extraction, production, and disposal, to more sustainable and regenerative models that emphasize resource efficiency, reuse, and long-term value creation.

As businesses adopt circular economy principles, they begin to operate within broader innovation ecosystems, where collaboration among multiple stakeholders becomes essential. These ecosystems consist of a variety of actors, including companies, research institutions, policymakers, and consumers, all of whom contribute to the development and scaling of circular practices. Central to the functioning of these ecosystems are orchestrators—key entities that play a pivotal role in coordinating and managing the interactions between the different participants. Orchestrators help align the diverse interests and goals of stakeholders, facilitating cooperation and ensuring that the ecosystem operates cohesively.

The role of orchestrators is closely linked to stakeholder theory, which emphasizes the importance of considering the interests of all parties involved in

or affected by a business's operations. In circular innovation ecosystems, orchestrators act as mediators, ensuring that the value generated through circular business practices is distributed fairly among stakeholders. This not only strengthens the resilience of the ecosystem but also fosters trust and long-term engagement among its members.

The literature suggests that as these ecosystems mature, they enable greater business model innovation by promoting knowledge sharing, fostering cross-sector partnerships, and driving systemic change towards sustainability. In this way, the evolution from a traditional business model to a circular business model and eventually to a circular innovation ecosystem represents a dynamic process of innovation that is both collaborative and stakeholder driven.

This conceptual framework underscores the growing recognition in the literature of the importance of interconnected networks in advancing circular economy objectives, as well as the crucial role that orchestrators and stakeholder theory play in the governance and success of these ecosystems.

3 Exploring the Role of Circular Economy in Business Models within Innovative Ecosystems

3.1 Abstract

For several years now, there has been much discussion about the circular economy and circular business models. Through a questionnaire distributed to companies of different sizes, we aim to understand the level of knowledge regarding the circular economy, but more importantly, the state of progress and how much larger companies involve smaller ones in integrating elements of circularity within their business models.

As the main objective of this research is to understand how large and small businesses interact on the topics of circular economy and industrial symbiosis. Specifically, through this questionnaire, in particular the aim is to examine the potential contribution that small and medium-sized enterprises (SMEs) can make to larger companies in terms of innovation, particularly regarding circularity within the business model. In this context, it is necessary to analyze the existing theoretical framework related to the study of relationships between companies and hypothesize their evolution in terms of circularity.

3.2 Introduction

This chapter investigates the awareness, integration, and collaborative potential of the circular economy within business models of companies operating in innovative ecosystems. Building on the concepts of districts, clusters, and innovative ecosystems, a structured questionnaire was delivered to 13 companies that regularly collaborate with the University of Trieste and are accustomed to engaging in innovation. The primary objectives were threefold: to assess the level of familiarity with circular economy principles, to understand how deeply these principles are embedded in current business models, and to

evaluate the companies' willingness to engage in collaborative efforts to enhance circularity within their business frameworks.

Results indicate a varied understanding of circular economy concepts among participants, with some companies demonstrating a strong grasp and others showing limited knowledge. Interestingly, while a few companies have already embedded circular strategies into their operations, the majority see the circular economy as a potential enhancement rather than a core aspect of their current models. However, there is a significant openness to collaboration, as most companies recognize the benefits of partnerships in overcoming barriers to implementing circular practices, such as shared resources, co-innovation, and enhanced market positioning.

This research contributes to the broader discourse on sustainable innovation, emphasizing that, while interest in circularity is present, stronger collaborative frameworks are needed to translate this interest into substantial, long-term business model transformations. In the rest of the chapter we will provide an overview of districts, clusters and innovative ecosystems (paragraph 3.3), linking these concepts to Open innovation (3.4) in particular in High Technology Small Firms (3.5). The method adopted (presented in 3.6) was applied to perform an analysis based on questionnaires submitted to a sample of companies will reveal the degree of capability and willingness to foster circular economical processes within the business models (3.7). Some conclusions (3.9) complete the chapter.

3.3 Districts, clusters, innovative ecosystems

The concept of clustering or agglomerations is not a recent development and can be traced back to the early research of Alfred Weber (1929) on local labor advantages. It is well established that clusters offer comparative advantages over non-clustered locations due to a certain level of openness, facilitated through various local business-to-business relationships in industrial districts during production (Hall, 1963; Marshall, 1920; Martin, 1966; Wise, 1949). Geographers, such as Taylor (1971) and Wood (1969), have emphasized the importance of

behavioral linkages, while economists, including Williamson (1975), have recognized the significance of informal information flows in valuable business transactions within agglomerations.

The identification of high-technology clusters at the end of the last century may have seemingly promoted the concept of open innovation (Oakey, 1985b). Silicon Valley, often cited as the most renowned high-technology cluster, has been interpreted by academics as evidence that localized open innovation, in the form of technical collaboration, was a major factor contributing to agglomeration advantage (Cardullo, 1999; Saxenian, 1985). However, while advantages exist in Silicon Valley, such as local venture capital, skilled labor, customers, and specialized subcontracted suppliers, information on new product technologies is generally kept confidential in this highly competitive business environment (Oakey, 2007b).

Skilled labor, although advantageous for High-Technology Small Firms (HTSFs), presents challenges in terms of labor poaching and loss through spin-offs, where new product ideas may be appropriated by spin-off technical entrepreneurs (Oakey, 1995; Roberts, 1991). Despite the term 'spillover' used by some academics to benignly describe this phenomenon, there is often limited technical contact between spillover firms and their previous employers once spun-off. Additionally, while venture capital is accessible to HTSF entrepreneurs in Silicon Valley, investment deals are typically struck on a formal basis, sometimes involving the removal of the founding entrepreneur. Although a variety of suppliers and subcontractors are available, customers prioritize the best service at competitive prices in their interactions (Oakey, 1985b).

A well-documented example illustrating the importance of external advice and customer feedback for HTSFs in a cluster is the case of Apple Computers. In the early 1970s, marketing consultants Mike Markkula and Regis McKenna played a crucial role in helping Apple refine the design and functionality of their new laptop computer by trialing the product with potential customers. This 'market-driven approach' emphasized the significance of customer input in finding applications for their innovative product. While this instance is an effective example of

customer interaction, the practice of seeking customer feedback and obtaining free information on product performance has been a consistent and essential aspect of sales representatives' work (Oakey, 1991). This highlights that, although R&D in HTSFs may be relatively closed, key support services remain open and have never been restricted.

The interactions described here, though valuable, are standard business behavior patterns. Whether these interactions truly exemplify open innovation is debatable and raises questions about whether the term 'open innovation' contributes anything new to our understanding of industrial relationships, a theme that will be revisited in the conclusion of this article.

When examining how clusters like Silicon Valley operate, a key challenge is reconciling the apparent conflict between collaboration and competition in a local area where both elements coexist. One way to resolve this dilemma is to observe that firms in agglomerations, such as Silicon Valley, tend to collaborate vertically with local customer or supplier firms within supply chains. For instance, a printed circuit board maker might collaborate with a computer manufacturer customer, exchanging technical information, yet fiercely compete horizontally with another local printed circuit board maker in their specialized technical area. This dynamic contributes to both collaborative advantage and competition. An example of this complexity is illustrated by Berlin (2010), who notes that Bob Noyce from Intel advised Steve Jobs during the founding of Apple Computers, and in turn, Steve Jobs advised Larry Page and Sergey Brin when they were establishing Google. This collaboration was possible because Noyce and Jobs were not in direct competition, highlighting that individuals are more likely to assist when they are not direct horizontal competitors (Oakey, 2012).

In the context of open innovation, this example suggests that while information exchange can occur between entrepreneurs within an industrial environment, such interactions are limited both in terms of sectoral scope and the quality of information exchanged among individuals (Gutmann, Chochoiek, Chesbrough, 2023). Specifically, information exchanges often involve general

advice on technical matters, while critical technical information related to new product development is closely guarded and not openly shared.

3.4 Open innovation

The established principle that innovation significantly influences the success of industrial firms, from local small businesses to multinational enterprises, is widely recognized (Denison, 1966; Freeman, 1982; Mansfield et al., 1977; Schmookler, 1966; Schumpeter, 1939; Solow, 1957). Consequently, there is a justified academic interest in exploring ways to foster and enhance industrial innovation at local, regional, and national levels (Rothwell and Zegveld, 1982; Thwaites, 1978).

While applauding Chesbrough's numerous contributions on 'open' product and service innovations and new business models aimed at reshaping industrial innovation (e.g., 2003a; 2006; 2010; 2011), it is essential to note a potential weakness in the empirical foundation supporting Chesbrough's work. His contributions, including the recent book on open service innovation in 2011, often rely on anecdotal examples, the work of other authors, and general government statistics rather than rigorous empirical studies testing formal hypotheses.

Beyond the empirical concerns, Chesbrough has faced valid criticism for constructing 'straw men,' implying that his ideas are groundbreaking when, in fact, openness in innovation is not a novel concept. Trott and Hartmann (2009) provide a compelling critique, asserting that Chesbrough's portrayal of a closed model of innovation as the norm is overly simplistic and not reflective of the diverse behaviors exhibited by firms, especially in the latter half of the 20th century.

Chesbrough's claim that large industrial firms primarily relied on closed innovation systems in the past is deemed overstated. Despite showcasing instances in the biotechnology industry where small firms outperformed large 'closed innovation' counterparts, Chesbrough overlooks the fact that many fast-growing biotech firms were acquired by 'open innovation'-oriented large pharmaceutical firms through predatory networking (Oakey, 1993). This practice has been widespread since

the end of World War II, challenging the notion that open innovation is a recent phenomenon.

The acquisition of high-technology small firms by larger corporations has long been a favored method for harvesting new technology. This approach combines elements of both 'open' and 'closed' innovation, as large firms seek external technology while internalizing intellectual property to strengthen corporate R&D capabilities. Trott and Hartmann (2009) argue convincingly that open innovation activities by otherwise closed innovation firms are not only longstanding but also enhance closed innovation efforts. This perspective holds implications for industrial policy, performance, and academic theory, particularly concerning innovative small firms (Rothwell, Zegveld, 1985; von Hippel, 1978).

At a broad level, the concept of open innovation captures the attention of academics involved in studying High-Technology Small Firms (HTSFs). This interest encompasses several aspects. First and foremost, HTSFs, primarily engaged in new product development through in-house Research and Development (R&D), stand to benefit from increased openness, potentially leading to improved innovative performance. Second, although reliant on internal R&D, HTSFs maintain significant connections with external sources of expertise, such as marketing, subcontracting, university consultancy, and capital funding. The potential enhancement of these external relationships, interacting with otherwise 'closed' HTSF innovation systems, is a consideration for greater openness in internal R&D activities. Third, as the technology developed by HTSFs often represents their primary and highly valuable asset, the question of openness becomes both an opportunity, through collaboration with external expertise, and a risk, as increased openness may compromise the confidentiality and, consequently, the value of their R&D assets. For instance, if collaborating with another firm in joint product development results in the appropriation of internally developed assets by the collaborating firm, legal action might be challenging due to the limited financial resources of most HTSFs. Thus, the cost-benefit analysis of increased openness becomes crucial.

The cumulative impact of these three key characteristics specific to HTSFs, which are relevant to open innovation, is used to construct a general argument suggesting that HTSFs are, and have always been, more 'open' than Chesbrough might assert. However, instances where these firms exhibit closed innovative behavior, particularly in R&D activities, are argued to be justified, driven by the need to maximize the quality of internal R&D efforts and protect valuable internally generated intellectual property. This article aims to make the case that, at least concerning HTSFs, the open innovation approach is either irrelevant because it already occurs in a measured manner or, when avoided, is justified for the reasons outlined below.

As previously discussed, many of Chesbrough's arguments on open innovation pertain to large industrial and commercial enterprises (2003a; 2011). This focus is likely because larger firms are better equipped to handle openness, given their financial resources that enable them to explore global economies for collaborative partnerships and external technology to complement internal R&D efforts. Their greater financial strength allows them to weather instances where open innovation collaborations fail and absorb the associated costs. Additionally, large firms can more effectively navigate legal disputes over jointly developed intellectual property. In contrast, the situation for HTSFs seeking collaboration with other firms is markedly different. Even in cases where there is a compelling basis for grievance, such as a breakdown in collaborative relationships, High-Technology Small Firms (HTSFs) often cannot afford the risk of engaging in costly and prolonged legal action that might not yield a satisfactory resolution (Faems, 2012; Macdonald, Lefang, 1998). This challenge will be further explored in the subsection on capital investment in HTSFs below. Consequently, the acquisition of HTSFs by larger counterparts, whether from the same or an adjacent sector, may be deemed acceptable on the premise that the technology held by the HTSF is not lost but rather stands to benefit from the larger firm's superior resources for further development.

While some degree of HTSF acquisition is unavoidable, maintaining a robust HTSF sector in any developed economy is crucial for at least two significant

reasons. Firstly, it is well-established that research conducted in HTSFs can be highly efficient compared to large high-technology firms (Cooper, 1970; Oakey, 1984; Rothwell, Zegveld, 1982). The close-knit teams of researchers in HTSFs, often led by a founding technical entrepreneur, experience minimal organizational or physical distance between HTSF management and R&D objectives, as often the same individuals perform both functions (Roberts, 1991). Despite spending less than large firms in absolute terms, the cost–benefit ratio of their output is often greater due to their high level of organizational and technical focus.

The structure of R&D in HTSFs differs significantly from that of large firms where the goals of senior management and those of a frequently physically separated R&D department may diverge. Many large firms have acknowledged the benefits of HTSF R&D by establishing small subsidiary firms located separately from the main company facilities or by taking equity stakes in new independent HTSFs with the prospect of future acquisition if the products under development prove successful (e.g., large pharmaceutical firms' activities in the biotechnology industry; Faems, 2012; Oakey, 1993; Oakey et al., 1990). The primary role of R&D in HTSFs is to develop new product technologies, often at the cutting edge of scientific knowledge. HTSF technical entrepreneurs typically emerge from universities (academic entrepreneurship) or from existing large high-technology firms.

Secondly, new HTSF entrepreneurs, often possessing both business and technical skills and lacking a vested interest in the technological status quo maintained by large firms, can think 'outside the conventional technology box' and instigate radical change. This independence enables HTSF entrepreneurs to challenge outdated product technologies maintained by large incumbent firms, leading to innovations that benefit consumers (Christensen, 1997; Oakey, 2012). In some cases, HTSF founders have played a crucial role in developing new products that large firms were unwilling or unable to develop due to market control issues. For instance, the willingness of Apple and other new computer manufacturers to produce affordable desktop computers in the mid-1970s for

personal use, thwarting IBM's reluctance to enter this market, is a notable example of this phenomenon.

Regarding open innovation, the potential for external collaboration in HTSF R&D focused on product development is constrained by two key features. First, many HTSFs are engaged in developing cutting-edge products based on state-of-the-art technology, making it challenging to find external collaborators who can contribute to this process. Second, the internal development of new products with high sales potential and possible disruptive impact must remain highly confidential to maximize financial returns and reward external investors in the event of success.

Nevertheless, this doesn't imply that various support services cannot be openly sourced from external providers (e.g., marketing advice, component parts, subcontracting production) – a practice of external engagement that has long been commonplace among High-Technology Small Firms (HTSFs), particularly when situated in or near high-technology clusters. Chesbrough's open innovation approach can be criticized for overlooking instances where confidentiality-based 'closed' innovation is strategically essential and not an outdated method in Research and Development (R&D). On the other hand, advocating for seeking external technical assistance from support services when appropriate is viewed by some as stating the obvious. This is a practice that so-called 'closed innovation' firms have employed since the inception of the industrial revolution. Chesbrough's inclination to assume that common commercial practices are not already occurring is evident in a quote from one of his recent works, where he argues, "Instead of treating customers as passive consumers, many companies are now involving customers in the innovation process" (2011: 21). In this instance, Chesbrough makes the error of suggesting that industrial firms do not embrace openness towards their customers. Empirical investigations into the operations of HTSFs have revealed that most HTSF managements recognize feedback from customers on ideas for new products and improvements to existing product performance as key benefits. This acknowledgment is reflected in the employment of sales staff to conduct customer visits, in addition to actual

selling activities (Oakey, 1984; 1991; 1995; 2012). As discussed below, any industrial firms neglecting to engage with their customers would likely face a short-lived existence in the business realm.

Nevertheless, it could be hypothesized that while internal Research and Development (R&D) and the resulting products from High-Technology Small Firms (HTSFs) are seldom conducive to open innovation, collaborative R&D focused on product development could serve as a means to stimulate a limited form of open innovation among HTSFs through inter-firm R&D projects (Chesbrough et al., 2006; Inauen Shenker-Wicki, 2011). There are indeed several significant advantages that may arise from jointly conducted R&D, including the sharing of both the risks of R&D failure and the costs associated with producing a successful product. However, investigations into the likelihood of HTSFs entering collaborative R&D agreements suggest that such collaborations are infrequent (Oakey, 1984, 1995; Klein-Wollhuis, 1999). Three main factors contribute to this lack of collaboration.

Firstly, the concept of collaborating with another firm outside the close-knit R&D environment of a single HTSF contradicts the fundamental principle that renders HTSF R&D effective – namely, minimal organizational and physical distance. Secondly, while collaboration might be appealing from a cost- and risk-sharing perspective, challenges associated with agreeing on relative inputs to the R&D process, determining the technological direction of joint research, and, crucially, dividing the benefits of R&D outputs upon successful product development can lead to disputes regarding financial contributions, roles, and rewards. Thirdly, the necessity to maintain confidentiality during joint product development, which often involves significant physical distance and a larger number of workers from different companies, frequently discourages HTSF management from engaging in collaborative R&D arrangements (Klein-Wollhuis, 1999). This tendency to avoid collaboration elucidates why the concept of open innovation is not readily applicable in most HTSFs, driven by sound strategic considerations.

There is substantial accumulated evidence indicating that High-Technology Small Firms (HTSFs) face significant challenges in securing investment capital for long-

term programs of product development-oriented Research and Development (R&D), especially in industries like biotechnology where the development period can extend up to 10 to 15 years (Oakey, 2007a). Traditional funding methods, such as short-term bank loans typically offered to small and medium-sized enterprises (SMEs), are not suitable for HTSFs due to the prolonged nature of their product development programs and the associated risks of failure. The primary avenue for funding HTSFs is through patient venture capital of various types. However, despite the existence of specialized public and private organizations willing to fund HTSFs, there has been a noticeable shift away from early-stage funding for high-technology businesses in the UK since the late 1980s, with a decline to 3 percent of total investments by the UK venture capital industry by 2010 (Oakey, 2012).

For venture capital organizations specializing in funding HTSFs, where both risks and rewards are high, a critical requirement for investment is the robust protection of any intellectual property related to the new product innovation. The success of a venture capital investment in an HTSF depends heavily on the technical success of the product and secure intellectual property ownership. Consequently, the idea that any part of this technology might be made available on some form of open innovation basis would be inconceivable.

When evaluating a business plan from a new HTSF seeking financial investment, prospective venture capitalists focus on two key aspects. First, they assess whether the HTSF's R&D efforts will lead to the creation of a highly marketable product within the projected timeframe and if it will succeed in its target market. Second, they seek confirmation that the technology can be legally safeguarded from competitors. HTSF founders seek venture capitalist support not only for the funding of long-term innovation programs but also because venture capitalists provide the capital strength required to protect newly-developed intellectual property from competitors who may attempt to reverse engineer or infringe upon any patents obtained once the product is on the market.

In some cases, HTSFs, after developing a promising technology, choose to sell out to a larger competitor firm to protect their technology from potential illegal

copying by other large firms. However, the crucial point here is that new product innovations developed by HTSFs are seldom compatible with open innovation. Incubators and science parks are often discussed together in the context of open innovation, mainly because they are frequently located on or near university campuses (Westhead et al., 2000). The general premise guiding these facilities is that emerging firms initiate their journey in an incubator, usually before formal business establishment and certainly before any production is feasible, to develop and refine their business ideas. Incubated enterprises receive on-site local services and management support, and the informal environment fosters networking opportunities among new entrepreneurs, aiming to facilitate progress through an open innovation approach. However, the actual experiences of incubated entrepreneurs, as well as academic studies on the subject, indicate that the sharing of information with external parties, especially technical information related to their business ideas, is seldom prevalent (Albert et al., 2002; Oakey, 2007b; Pittaway, Robertson, 2004; Stockport, Kakabadse, 1994). Whether the business idea is high-technology or a new variation on a generic business model, entrepreneurs in the incubation phase are highly concerned about maintaining confidentiality. They are wary of the possibility that sharing their idea within the incubator might result in theft before it can be properly exploited or protected. For these entrepreneurs, whether engaged in manufacturing or providing a service, the novelty and surprise integral to their innovation could be compromised through an open innovation approach. Consequently, the fundamental concept of incubators appears somewhat flawed due to a somewhat naïve assumption about the openness of the business environment within the incubator. Similarly, in the 1980s, the belief in a particular model of industrial innovation was a driving force behind university science parks. However, similar issues arise when new firms transition from local incubators to science parks or when they are attracted to a science park from the local industrial environment. Concerns about confidentiality and the close-knit teamwork typical within High-Technology Small Firms (HTSFs) have curtailed the level of collaboration with university academics, a factor often emphasized in science park literature in the 1980s (e.g., Trinity College, 1983). Additionally, it

has been observed empirically that since the new product developments of HTSFs are often cutting-edge in specialized scientific fields, the notion that university academics would readily provide detailed technical assistance over short time spans to benefit HTSF R&D teams is overly simplistic. This skepticism is not isolated, as it is consistently supported by other research, indicating poor R&D collaboration between high-technology science park firms and physical science departments of adjacent European universities (Lindholm-Dahlstrand and Klofsten, 2002; Massey et al., 1992; Westhead, Cowling, 1995; Westhead et al., 2000).

In addition to the challenges mentioned, there is a growing trend in both the UK and the USA where universities increasingly view their R&D outputs from academic departments as intellectual property to be confidentially exploited for raising capital. Legislation such as the Bayh-Dole Act of 1980 in the USA and various government initiatives in the UK have aimed to replace public funding of universities through the commercial exploitation of their intellectual property. This shift has impacted the openness of publicly available scientific knowledge, particularly in fields like biomedicine (e.g., gene technology). There has been a departure from the traditional practice of not patenting medical discoveries to a 'patent everything' approach. This trend, ironically, has intensified at a time when the concept of open innovation has been gaining prominence.

In summary, the limited success of both incubators and clusters can largely be attributed to a general reluctance on the part of academics and business founders to openly share their embryonic ideas or the outcomes of costly R&D efforts. In such circumstances, the notion that the creators of modern high-technology are becoming more open about sharing innovations in general, and successful product innovations in particular, is questionable.

3.5 Strategy and Open Innovation in High-Technology

Small Firms (HTSFs)

The growth strategies pursued by new HTSFs can be broadly categorized into two distinct approaches. Firstly, many HTSFs are established by individuals, often from universities or large firms, seeking independence from the constraints of larger organizations. Founding a HTSF provides the owner (or owners) with complete control over key functions such as funding, research and development (R&D), production, and marketing (Oahey, 2003). The desire for independence often results in strong resistance to external attempts to purchase any part or the entirety of the firm. On the other hand, there are HTSFs established with the primary goal of financial success. These firms actively seek venture capital to fund the startup phase and prolonged R&D periods before achieving profitable sales. They typically adopt a 'grow to sell' policy from the outset, outlined in a business plan that specifies a precise date for an Initial Public Offering or trade sale. This timeline is crucial for venture capitalists, signaling the point at which they can exit and realize returns on their invested capital.

Despite the stark differences in these growth strategies, both types of HTSFs share a common approach to product innovation—an unwavering commitment to extreme confidentiality regarding the new technology under development. Whether the aim is independence or eventual business sale, the technology in progress stands as the firm's primary asset. Failure or theft of this asset would jeopardize the strategic objectives of independence or a successful 'grow to sell' strategy. The crucial aspect to consider in the context of open innovation is that neither of these strategic approaches involves openness. As previously emphasized, the time, capital, and effort invested in developing new technology form the essence of the firm for both the founder (or founders) and/or the investing venture capitalist. Preserving confidentiality is paramount, as any lapses could lead to the squandering of these vital resources. Given the numerous potential pitfalls that can lead to the failure of a HTSF, the control of intellectual property protection related to any new product under development

becomes a critical aspect of the firm's operations. Consequently, the concept of open collaboration during innovation is seldom entertained by these firms, and internal R&D stands out as the primary method for achieving progress. Throughout this article, it has been consistently observed that external R&D interactions with universities and other firms are infrequently pursued. Even when such contact does take place, it is typically driven by the need for secondary support information rather than a willingness to share cutting-edge internal R&D details with external parties. Therefore, neither of the two main strategies employed by new HTSFs aligns with the principles of open innovation.

3.6 Method

This study is based on an empirical investigation conducted through the conducting of a structured questionnaire to a heterogeneous sample of companies of different size. The main objective of the research was to understand if and how these companies interact with each other to introduce elements of circular economy into the business models of larger enterprises, leveraging the innovation brought by small companies. Thirteen companies of mainly small and medium sizes have been selected, as well as three spin-offs from the University of Trieste across various industry sectors. The aim is to understand the level of circularity present in the business models of these companies and how much of this is driven by collaboration with other companies.

The selection of the companies to which the questionnaire was administered was due to contacts established through the Contamination Lab of the University of Trieste, the university academy dedicated to spreading entrepreneurial culture among students. These are companies that, despite being in different industry sectors, have a propensity for innovation and collaboration with research institutions and universities. The logic of the firm selection was framed considering their experience in collaborating with research institutions as an indicator of their openness towards collaboration for innovation.

The selected companies are small in size, typically characterized by a lean organizational structure and limited resources compared to larger firms. Despite their size, these companies stand out due to their innovative drive, which plays a central role in their business strategy. One of the defining traits of these companies is that many of them are university spin-offs. This means they were born out of academic research projects, leveraging cutting-edge knowledge and technology developed within the academic environment. For those that are not direct spin-offs, they nonetheless maintain a strong connection to innovation, either through partnerships with research institutions or by actively engaging in research and development activities aimed at improving their products, services, or processes.

Their inclination towards innovation is evidenced by their participation in regional innovation funding programs. These calls are designed to support companies that demonstrate a commitment to advancing technology or improving market competitiveness through innovative solutions. Being involved in such programs not only provides financial support but also serves as a recognition of the company's capacity for growth and its potential to drive technological progress. In addition, many of these companies maintain close collaborations with universities, benefiting from ongoing access to academic research, talent, and insights, which they can apply to their commercial activities.

The selected companies span a variety of sectors, highlighting the diverse nature of the innovation landscape. While some are service-oriented, offering consulting, professional, or technical services, others focus on information technology (IT), where they develop software, provide IT services, or work on hardware solutions. The breadth of their innovations may range from process improvements and data management to the creation of entirely new IT platforms. In addition, the logistics sector is represented, with companies providing innovative solutions for supply chain management, transportation optimization, or warehousing, thus addressing the evolving challenges of global trade and distribution networks.

3.6.1 Data

The companies as in Table 2 were considered.

Company Name	Production Value 2023	Production Value 2022
Prodigys Technology S.r.l.	4.424.293€	3.642.191
PICOSATS S.r.l.	1.158.424€	4.14.159€
CARPE DIEM S.r.l.	675.586€	438.447€
Bilimetrix S.r.l.	123.430€	45.710€
Esteco s.p.a.	11.099.205€	10.664.257€
M2Test S.r.l.	8.433€	13.688€
ARCO SOLUTIONS S.r.l.	2.577€	/
Alisea srl Società Benefit	1.521.967€	1.436.368€
Bio imed S.r.l.	45.750€	/
Elevante S.r.l.	295.863€	324.269€
Jolanda de Colo s.p.a.	29.809.615€	30.688.905€
Aster Coop Soc. Coop	43.684.689€	43.968.937€
Perpetua	760.983€	718.184€

Table 2. Interviewed companies (source Chamber of Commerce of Trieste)

The companies belong to the economic sectors as presented in Figure 1.



Figure 1 :Breakdown by economic sector of the surveyed companies.

3.6.2 Questionnaire Structure and Relevance of Questions

The questionnaire was meticulously designed to collect in-depth data on inter-company relationships and the adoption of circular economy (CE) practices within various business contexts. Inspired by core concepts in sustainable business models and innovation ecosystems, the questionnaire structure aimed to capture not only the current state of circularity within each participating company but also potential motivations, barriers, and willingness for collaborative integration of circular economy principles.

The questionnaire was divided into three main sections to align with the study's primary objectives:

1. Company Profile and Sectoral Context

The first section gathered information about the basic characteristics of each company, such as industry sector, size, and length of establishment. This information is essential for identifying patterns and correlations between specific sectors and a company's propensity to adopt CE practices. Additional questions probed the respondents' current familiarity with CE principles, aiming to map knowledge levels across different industries and gauge baseline awareness. This section enabled a nuanced segmentation of companies, which helped identify sector-specific opportunities and challenges regarding circularity.

2. Current Integration of Circular Economy Practices

In this section, companies were asked detailed questions regarding the extent to which circular principles are embedded in their business models. Questions were structured to explore whether companies had made specific modifications to their products, services, or processes in alignment with circular principles, such as resource efficiency, waste reduction, and recycling. These questions aimed to capture both current practices and strategic intentions, offering insights into how CE values manifest in business models across sectors.

3. Collaboration and Openness to CE Innovation

The final section evaluated the companies' willingness and readiness to engage in collaborative efforts that foster CE practices. Companies were asked to indicate their level of interest in partnerships aimed at achieving common CE goals, such as resource-sharing agreements, co-investments in sustainable technologies, and joint ventures for circular supply chains. By exploring these aspects, the questionnaire aimed to identify potential pathways for fostering collaborative innovation and shared-value creation within industry clusters.

To facilitate data collection and ensure ease of access, the questionnaire was developed in Google Forms. This digital format allowed for efficient distribution and completion, as well as convenient data aggregation for analysis. The form was distributed to the CEOs or senior managers at each of the 13 companies, ensuring responses from individuals who were well-versed in the strategic directions of their organizations and familiar with the study's themes.

Subsequently, the past experiences of the companies in circular economy projects are examined, distinguishing between individual projects, supply chain projects (industrial symbiosis), and technological or sustainable innovations. The questions also explore the main challenges or barriers perceived in the implementation of such projects, such as the lack of specific knowledge, high innovation costs, and difficulties in finding suitable technical and economic partners.

The second part of the questionnaire focuses on collaborative relationships between companies. Existing collaborations are investigated, the legal nature of these relationships (e.g., subcontracting, consultancy, research and development), and the ability of companies to integrate circular economy elements into their business models through these collaborations.

The selected sample of companies was asked to respond to the following set of questions. The goal is to understand the level of knowledge about the circular economy and how successfully these companies have been able to integrate circularity elements into their business models. You can find the questionnaire questions in Annex1.

3.7 Results and discussion

This diversity in both the industries and the innovative approaches these companies take demonstrates that innovation is not limited to one sector or type of business. Instead, it is a critical factor across various fields, driving competitiveness and growth in both the local and broader economic landscape. As we delve into the specifics of these categories, it becomes clear how each company contributes uniquely to the overall innovation ecosystem.



Figure 2: Most commonly used words by the companies that participated in the survey (elaboration <https://googiehost.com/it>)

From the collected data, it emerges that only in a few cases can small enterprises, despite the challenges related to their size and resources, provide a significant innovative contribution to large companies, particularly in terms of circularity. Collaboration between small and large enterprises thus proves to be a key factor in integrating circular economy practices into the business models of large companies. Moreover, the identified barriers, such as regulatory complexity and the lack of knowledge exchange networks, highlight the need for greater institutional and policy support to facilitate such collaborations.

To the question "Have you developed a circular economy project?" 76.9 percent of the companies responded no and only the 23,1% yes.

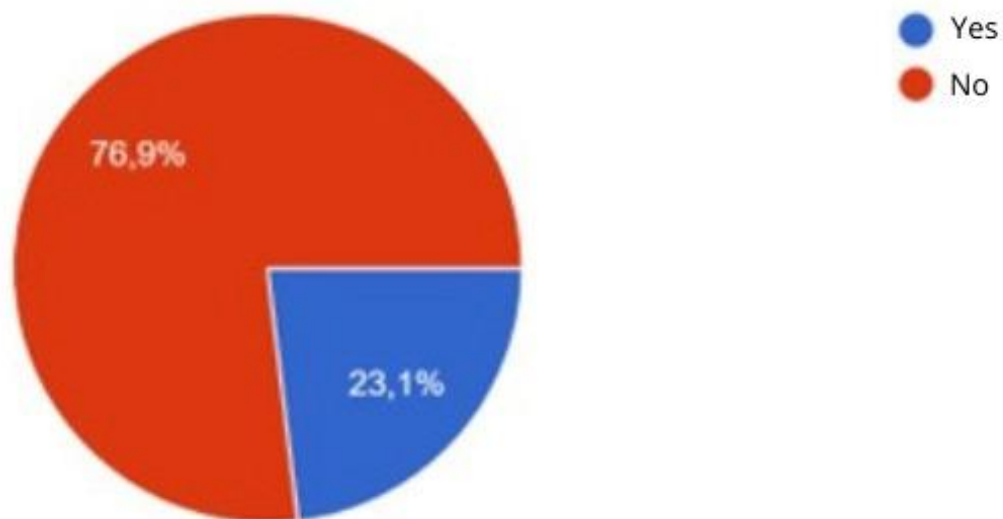


Figure 3: Participation and circular economy projects.

It is very interesting that those who have developed circular economy projects focus on product and process innovation.

It is noteworthy that entities engaged in circular economy projects tend to concentrate on both product and process innovation. This dual focus reflects a comprehensive approach to sustainability, where advancements are made not only in the end products but also in the underlying processes of production and management. This emphasis on innovation across both dimensions highlights the

commitment of these organizations to integrating circular principles into their operations holistically.

This approach offers several advantages. Firstly, by innovating products, companies can enhance their durability, recyclability, and efficiency, leading to reduced environmental impact and extended product life cycles. Secondly, improvements in production processes can lead to more efficient resource use, lower waste generation, and reduced energy consumption. Together, these innovations contribute to a more sustainable and resilient business model, positioning companies as leaders in environmental stewardship and potentially reducing operational costs in the long run. Furthermore, adopting such comprehensive strategies can enhance brand reputation and customer loyalty, as consumers increasingly value sustainability in their purchasing decisions.

It is interesting that, in response to the question, "Among the following entities, with whom would you initiate (or have already initiated) a collaboration to develop circular economy projects?" the sample clearly indicated that they would collaborate with universities and research institutions, while they do not consider collaboration with clusters (Figure 4)

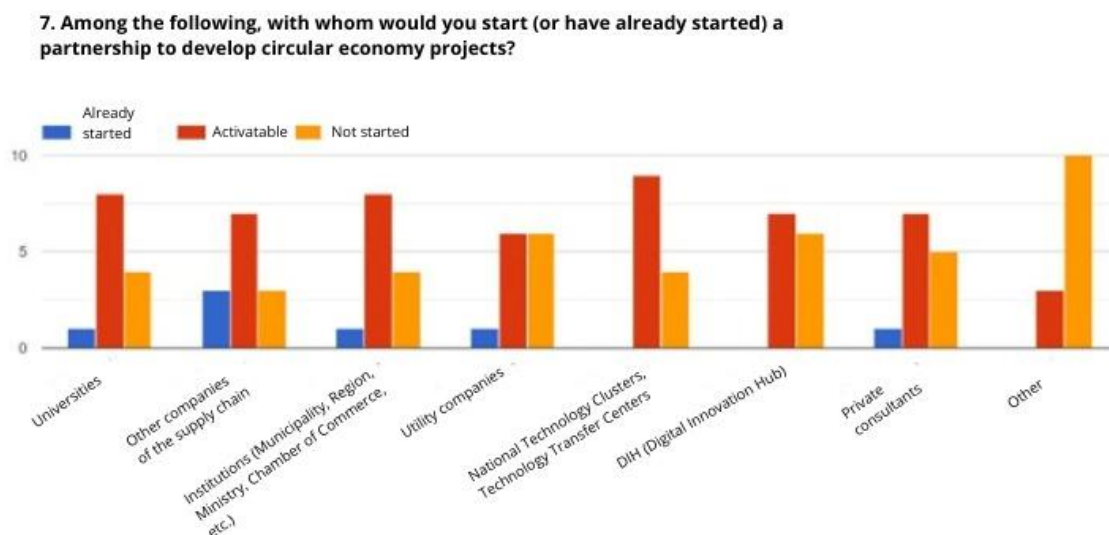


Figure 4: Company preferences in collaborations.

It is noteworthy that, in response to the question, "Among the following entities, with whom would you initiate (or have already initiated) a collaboration to develop circular economy projects?" the sample clearly indicated a preference for collaborating with universities and research institutions, while perceiving collaborations with clusters as less viable.

This preference highlights a strategic approach where academic and research institutions are seen as key partners in driving innovation and advancing circular economy initiatives. These institutions often offer specialized knowledge, cutting-edge research capabilities, and a collaborative environment conducive to developing sustainable solutions.

On the other hand, it is evident that the primary barriers to creating circular economy projects are: insufficient knowledge of the subject, the high cost of product or process innovation, and difficulties in finding suitable partners. The lack of expertise can hinder the effective implementation of circular principles, as organizations may struggle to understand and apply complex sustainability concepts. Additionally, the financial burden associated with developing innovative products or processes can be a significant deterrent, particularly for smaller firms or those with limited resources. Moreover, challenges in identifying and securing appropriate collaborators can further impede progress, as successful circular economy projects often require a network of diverse stakeholders to address various aspects of the supply chain and resource management.

Addressing these limitations requires targeted strategies, including enhanced educational efforts, financial incentives, and the development of networks to facilitate partnerships. By overcoming these barriers, organizations can better harness the potential of circular economy projects to achieve sustainability goals and drive long-term economic and environmental benefits.

In your opinion, is your company capable of integrating elements of the circular economy into its business model? The 46.2% of interviewed responded that it is integrable but not yet integrated, 38.5% responded no, and 15.4% responded yes (Figure 5).

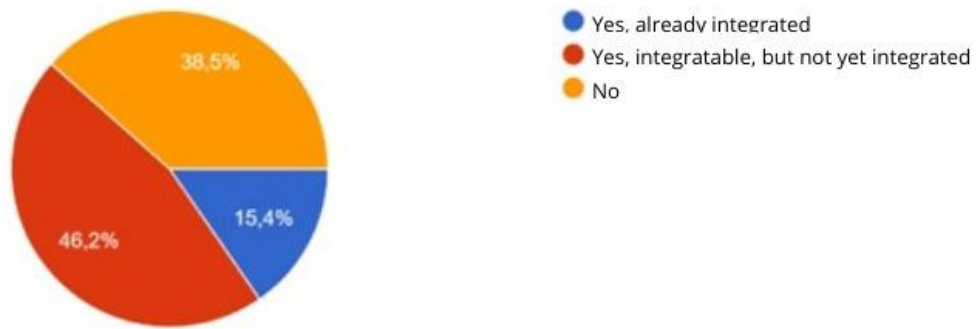


Figure 5: Perception of circular economy integration.

In response to the question, "If there are already elements of circularity in the business model, do you believe they can be further implemented?" 69.2% of the companies responded no, while 30.8% responded yes (Figure 6).

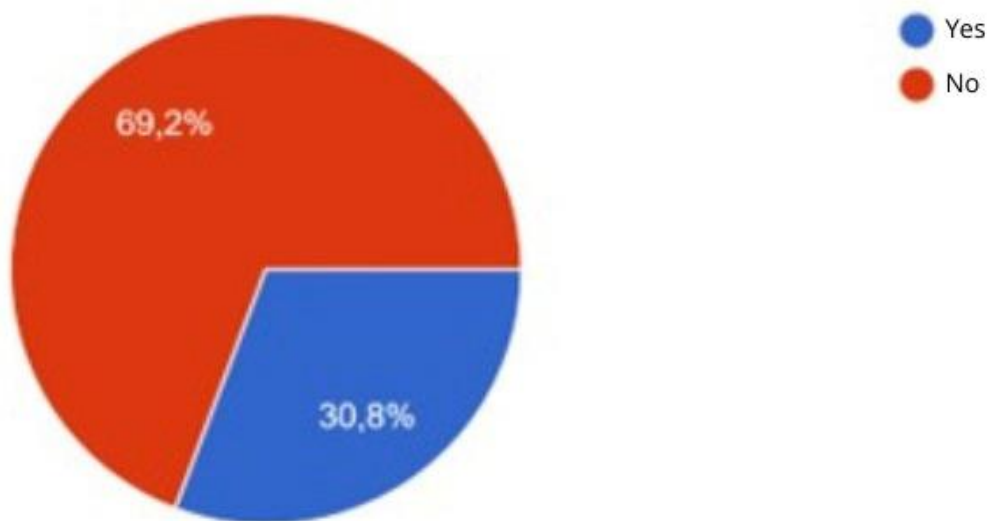


Figure 6: State of the art on initiated circular economy projects.

3.8 Conclusions

The questionnaire (as in Annex 1) has made it possible to collect relevant information for understanding the dynamics of relationships between small and large enterprises in circular economy contexts. The results suggest that inter-company collaborations can be fundamental in promoting circular innovation but require a favorable environment that overcomes the current implementation barriers. This study thus contributes to the existing literature on inter-company relationships and proposes further research lines on the evolution of circular practices in business models.

In particular, the findings from the survey conducted with the selected companies reveal an encouraging level of awareness regarding the principles of the circular economy. These companies demonstrate a clear understanding of the need to transition from traditional linear models of production—based on "take, make, dispose" practices—towards more sustainable and regenerative models that prioritize reducing waste, reusing materials, and recycling resources. This recognition is an important first step toward building a more sustainable business landscape, as the circular economy aims to decouple economic growth from the consumption of finite resources.

One of the most promising insights from the survey is the strong willingness among all the companies to collaborate with other stakeholders in order to implement circular economy projects. This openness to cooperation suggests that these businesses see value not just in innovating internally but in building networks and partnerships that can amplify their impact. The idea of collective action in the circular economy is vital, as no single company can tackle the complexities of sustainability alone. Whether through shared resources, joint research initiatives, or supply chain collaborations, working together allows companies to better address challenges and scale up circular practices.

It is particularly interesting that many companies expressed a preference for collaborating with universities or research institutions to integrate circularity into their business models. This points to a growing recognition of the importance of

scientific knowledge, technical expertise, and research-driven innovation in driving sustainable business transformations. Universities and research centers offer access to cutting-edge technologies, new methodologies, and talent, which companies can leverage to design more circular products, optimize processes, and reduce their environmental impact. These collaborations also provide companies with insights into the latest developments in materials science, waste management, and life-cycle assessment, which are critical for designing circular strategies.

Despite the widespread interest in collaboration, the survey highlights a gap between intention and action. While many companies express a desire to engage in circular projects, only one Alisea has successfully established strong, ongoing collaborations to implement circular economy elements in its business model. Alisea's leadership in this space demonstrates how strategic partnerships can serve as a model for other firms looking to deepen their sustainability efforts.

The qualitative analysis was particularly important to highlight an important case study to be more in depth observed for its openness in integrating circular economical process. This case study is related to Alisea company and its networks of business relationship as an important case of ability to innovate in circularity is closely linked to its continuous investment in research and development (R&D). This focus enables the company to remain at the forefront of new technologies and practices that facilitate circular operations. Alisea actively applies circular economy concepts across its business, from product design to supply chain management, highlighting that innovation in circularity requires a sustained commitment to exploring new opportunities.

With reference to the major framing of the research questions, and with particular reference to the current integration of Circular Economy Practices and Openness to Circular Economy Innovation, it resulted that all of the companies involved are aware and interested in the topics and in implementing case studies and projects. However, for some of the companies involved, their market sector has not yet evolved towards a circular economical model. Other companies did not

implement yet ad hoc projects or invested in developing circular economical projects.

In conclusion, the survey reveals that while the awareness of the circular economy is high among the selected companies, the ability to implement such practices effectively varies. Alisea stands out as a key player due to its strategic partnerships and continuous focus on research and innovation. For other companies to follow suit, they will need to bridge the gap between intention and action, likely by developing deeper collaborations with academic institutions and committing to long-term R&D initiatives. As the circular economy continues to gain traction globally, companies that invest in these areas will be better positioned to adapt, grow sustainably, and remain competitive in an increasingly resource-constrained world.

The main findings from the survey reveals that there is still a mismatch between the major academic theoretical framework - as analyzed in the literature review and in the overall direction of application of circularity in business models and markets - and the effective and current operations performed by companies, with few exceptions that represent pioneer companies in integrating circularity within the business model.

3.9 Annex 1

Part One - Company Framework

COMPANY NAME

1) Indicate your company's ECONOMIC SECTOR

Agri-food Mechanical/Mechatronic

Construction Tourism Fashion/Textiles Furniture Nautical Services

2) How would you define your level of knowledge about the circular economy?

I am an expert I am well-informed I have heard about it before This is the first time I've heard about it

3) Have you developed a circular economy project?

YES

If yes, what type:

Individual project Supply chain project (symbiosis) Technological innovation Sustainable product innovation Sustainable process innovation

Sustainable innovation in the business model

OTHER

What was the added value for the company?

NO

4) In your opinion, what are the main challenges or barriers to implementing and managing a circular economy project in your company, both internal or external?

Lack of knowledge/training on the topic

Process and product innovation are too costly

Limited knowledge of innovative technologies and new materials

Difficulty identifying (and selecting) technical, economic, and/or supply chain partners

Difficulty obtaining funding for project development

Complex/bureaucratic regulations

Limited knowledge of successful Circular Economy projects (benchmarking)

Lack of a network for sharing experiences/challenges/results/technologies and materials

OTHER

5) Among the following entities, with whom would you activate (or have already activated) a collaboration to develop circular economy projects?

Entities Already Activated Potential Collaborations

Universities

- Other companies in the supply chain
 - Institutions (Municipality, Region, Ministry, Chamber of Commerce, etc.)
 - Public utility companies (public transport, urban hygiene, energy supply, water supply, etc.)
 - Technological clusters, Technology transfer centers
 - DIH (Digital Innovation Hub)
 - Private consultants
 - OTHER
-

Part Two

6) Does your company have relationships with other companies in terms of circularity (e.g. reuse of production waste, secondary raw materials, etc.)?

- Raw materials
 - Semi-finished products
 - Process management
 - OTHER
-

7) What type of legal relationship exists?

- They are subcontractors

They assist the company in research and development

Private consultants

OTHER

8) In your opinion, is your company capable of integrating circular economy elements into the business model?

YES, already integrated

YES, integrable but not yet integrated

NO

OTHER

If yes, how?

If there are already elements of circularity in the business model, do you think they can be further implemented?

YES

NO

If yes, how?

9) Does collaboration with other companies enable your company to integrate circularity elements?

10) Do you own shares in these companies?

YES

NO

OTHER

11) For what reason did you acquire them?

If yes, for what reason?

4 Circular economy, industrial symbiosis, business model innovation and the transition to innovation ecosystems. The Alisea case study

4.1 Abstract

The growing importance of concepts as circular economy and industrial symbiosis has led to the emergence of a strong interconnection between territorialization, industrial districts and innovation of business models implemented by companies. In this chapter the is to examine how localization choices and collaboration within industrial districts can influence business model innovation, including industrial symbiosis within them.

The study area taken into account in this analysis is the Veneto region, in Italy and the case study involves a manufacturer of recycled graphite pencils, that represents an important example of collaboration between companies of different sizes and encourages sustainable practices. In this context, the work attempted to analyze the territory of the Veneto region, which is characterized by the presence of a large number of industrial districts, taking also into account the adoption of industrial symbiosis through strategic circular practices. In addition, it is investigated how the strong specialization of the sector and collaboration between companies and how sustainability, implemented through the reduction of waste production and the use of by-products has influenced the business model innovation of the company.

4.2 Introduction

The growing interest in sustainable development has led to a redefinition of the economic development process, moving from a linear structure to a circular vision. The reason for this change is that economic theory and application in the linear model pay little attention to quantifying resources and waste management, prioritizing production processes, employment, value creation, product distribution and sales. The importance of resources and waste in circularity lies

in minimizing negative externalities and optimizing production while reducing environmental impact.

The Industrial Symbiosis (IS) concept aims to enhance resource utilization and waste reduction by integrating and collaborating with different companies and sectors. In fact, the issues relating to the Circular Economy (CE) and IS are key elements in several areas, including the location of production activities. In this context, the IS results in the integration and collaboration between different companies and sectors, whose aim is to optimize the use of resources and the minimization of waste, achieving efficiency within production processes.

Among the different definitions of CE we find the one provided by the Ellen MacArthur Foundation (2016): "A CE is an economy that is designed to be regenerative and restorative, and that aims to keep products, components and materials at their maximum use and value at all times, distinguishing between technical and biological cycles." This leads to a closed-loop economic model in order to reuse waste generated that will become second raw materials.

Consequently, a sustainable production/economic system where resources are kept in use as long as possible, waste is minimized, natural systems are restored, and materials are regenerated at the end of their life cycle can be developed and maintained through the integration of IS and CE concepts. Thus, these phenomena are associated with circular practices.

The sharing of ideas, skills, and resources is the primary feature of industrial districts, which are groups of companies located within a given territory. Over the years, they have evolved into clusters, characterized by strong specialization in a given sector and strong collaboration between companies. Both industrial districts and clusters promote innovation and business competitiveness through a wider network of stakeholders.

For this, it is also necessary to refer to the business model of a company, which constitutes the way in which it distributes and incorporates value. In order to adapt to market changes or gain a competitive advantage, companies must renew this model through business model innovation, which allows the introduction of new logics, products or services. In this context, we can refer to an innovative ecosystem, a complex network of players who interact and co-create value.

Circular innovation is key to their success, as it encourages collaboration among various stakeholders and the development of solutions aimed at minimizing environmental impacts.

In particular the question is on how the bigger companies can benefit from the innovation coming from the smaller ones, while these can, by means of the relationship with the bigger ones, benefit of reaching broader markets. As the theoretical background of such relationships seem to be mature enough, as it was analysed by means of the literature reviews on concepts as CE, IS, Business Model, as well as in the evolution of spatially located enterprises from industrial district through to clusters and towards the more recently defined innovative ecosystems, little evidence can still be observed in the real world cases.

In this framework, this chapter is aimed at explaining how collaboration between small and large companies can help to promote CE within the business models of large companies. Thus, we have outlined the theoretical background and conducted a literature review on the topic, choosing an area of study and case study that is particularly significant in terms of innovation related to CE and IS.

The focus of the analysis involves Alisea S.r.l., a manufacturer of recycled graphite pencils, situated in Veneto, a region of Italy, due to their ability to foster collaboration between companies of different sizes and encourage sustainable practices.

The rest of the chapter is organized as it follows: paragraph 4.3 presents the Theoretical background and literature review; sub-paragraph 4.3.1 Innovation and spatial diffusion; sub-paragraph 4.3.2 Innovation and industrial localization: districts and clusters. Sub-paragraph 4.3.3 presents the business model innovation path within circular economy and industrial symbiosis; sub-paragraph 4.3.4 sustainable business model innovation; sub-paragraph 4.3.5 The firm and its network: business and cross-sector collaborations; sub-paragraph 4.3.6 Innovation circular ecosystems and industrial localization; paragraph 4.4 Methods, the case study, data; sub-paragraph 4.4.1 Methods; sub-paragraph 4.4.2 The Study area; sub-paragraph 4.4.2 The case study: Alisea s.r.l ; sub-paragraph 4.4.3 The data. Paragraph 4.5 is focused on the Results; sub-paragraph 4.5.1. The 'Perpetua' revolution; sub-paragraph 4.5.2 Alisea's

Business model and initial collaborations; sub-paragraph 4.5.3 Network and collaboration; paragraph 4.6 Discussion; paragraph 4.7 Conclusions.

4.3 Theoretical Background and literature review

4.3.1 Innovation and spatial diffusion

Innovation has over time achieved a strategic role in regional policies, as well as being a central element in spontaneous dynamics. Indeed, regional administrations and development agencies have extended and implemented specific policies to promote innovation, identifying themselves as a key element for economic growth. Through coordinated actions, these policies aim to create innovative ecosystems. This includes the need to support research and development, the training of skilled human capital, the improvement of technological infrastructures, and cooperation between enterprises, universities, and research centres, resulting in a favorable environment for the dissemination of knowledge at a territorial scale. In this context, regional innovation policies are not only the lever for stimulating territorial competitiveness but also a tool to foster sustainable development of local communities and attract investment.

Nowadays, environmental sustainability, digitalization, and globalization are also factors that regional policies must consider.

Another concept which needs to be considered is spatial diffusion which refers to the movement of a single event or set of events in a given space and time, leading to the realization of a process and creating a pattern of geographic diffusion (Hagerstrand T., 1967; Gould P.R., 1969; Morrill, R.L., 1970). Geographers examine the many and diverse phenomena of exchange and contact between regions as diffusion processes from the perspective of innovation, technology, epidemics, and economic development. The study of this phenomenon has led to the categorization of the different possible diffusion of innovation. When we refer to spatial diffusion, we can talk about two main ways in which it can occur: relocation and expansion. Relocation occurs when physical movement takes place and the phenomenon is relocated from its origin to a new location (e.g. migratory phenomena). On the other hand, the expansion involves the spatial

and temporal extension of a state or event to cover and fill all available space. At the same time, the expansion or diffusion of innovation can occur in multiple ways:

- Contagion: It spreads through direct contact.
- Network: It spreads through connections between people, such as friends, colleagues or family members.
- Hierarchical: It starts from the most important and influential places and then spreads to smaller places.
- Waterfall: cascading down from the highest levels to the lowest levels. (Murgante et al., 2020)

So, contagion can result in diffusion processes that occur locally and through direct contact between those who bring about the innovation and those who are not involved yet. For hierarchy, it develops through privileged channels, through rapid spread from major to minor centers. Finally, the so-called cascade spread moves rapidly from top to bottom, slowing down the transition from the smaller centers to the higher ones and then accelerating once you reach the larger centers. (Murgante et al., 2020.)

Spatial diffusion and innovation are both closely connected, as they refer to how new ideas, technologies, or trends spread throughout the territory. Indeed, spatial diffusion refers to the movement and distribution of a specific phenomenon in space. On the contrary, innovation diffusion refers to the adaptation of new ideas or technologies within a community. Moreover, process and product innovation can also have local implications, such as the introduction of new production technologies that could result in a reorganization of economic structures.

With reference to the spread of innovation, we can find several examples to represent it at best: the industrial revolution is its emblem, as it originated in the 18th century in the United Kingdom, it subsequently spread throughout Europe and subsequently throughout the world, redesigning local economies and developing industrial cities.

Thus, the diffusion of innovation is a process that involves multiple factors, from geographic constraints to the economic and social sphere, that profoundly alters the territorial fabric. It is therefore essential to understand how this phenomenon

moves in space in order to observe its impacts and plan territorial development correctly, but also to understand the industrial spatial localization such as districts and clusters.

4.3.2 Innovation and industrial localization: districts and clusters.

The diffusion of innovation, CE and IS are concepts strictly connected with spatial proximity and industrial localization. Historically, location of industrial activities had - and still has - an important impact on socio-economic development of countries and regions and on companies competitiveness. (Murray A. T., 2009). In economic space, a set of functional and hierarchical relationships determine the division of labor between different territorial units where the ultimate goal is to explain those complex sets of relationships. (Friedmann J., 1979).

To examine the issues of circularity and spatialization in the evolution of industrial districts, it is intriguing to examine the classical theories of industrial localization. Analyzing the reasons for decisions regarding position and distribution in both the public and private sectors, taking into account resources, goods, services, and people, is the focus of various theories in the literature on the spatial location of production activities. Understanding certain spatial patterns of activity and knowledge is necessary for making forecasts and planning the provision of services.

Weber's theory of optimizing production costs was formulated during the early 20th century. In this theory, the location decision was determined by three primary factors: proximity to raw materials, proximity to consumer markets, and accessibility to transportation (Weber, 1929). Companies, according to Weber, try to minimize costs by moving to places that offer an optimal balance between these factors and the strategic significance of location decisions, empathizing industrial competitiveness. Classical Weber's model can be applied to circularity as it has been already investigated in a previous project named MEISAR - "Materials for Sustainable Construction and Infrastructure: the Recycled Aggregates" (Balletto et al., 2019). His theory tries to minimize all costs related to the transport of materials, energy and products extended to recycled waste in the double nature of waste and potential secondary raw materials. In this sense,

a change of paradigm is necessary since the place of production, becomes also a place of origin of second raw materials.

Other lines of thought have been developed to interpret industrial localization, in addition to Weber's theory, due to the evolution of economic and geographical thinking.

For example, we can refer to the theory of growth poles, according to which economic development is concentrated in certain poles, also called centers, from which the impulses of growth also spread to surrounding areas. According to this theory, economic development does not spread homogeneously in space, which consequently introduces an element of dynamism within economic spatialization, highlighting the role of industries in initiating territorial development processes. (Perroux , 1955) Thus, localization becomes strategic, with the poles acting as central hubs of innovation and development. (Rodigue , 2020).

The debate was further enriched by other scholars who introduced the concept of space production, focused on power relations, and highlighted the impact of economic and social policies on locational dynamics. (Smith , 2002; Harvey D., 2005).

This evolution later led to the concept of industrial district (Marshall, 1919). In this concept, it is observed that the geographical concentration of small and medium-sized enterprises can lead to a desirable economic environment, which is characterized by positive externalities such as sharing skills and knowledge. These enterprises were categorized as 'external economies' and included economies of scale, which was a result of their specialization and proximity to production areas; economies of scope, which was a result of cooperation among enterprises, innovation and knowledge diffusion, which was a result of physical proximity and relationships.

Nevertheless, the concept has evolved over time. As we mentioned above, the industrial district concept begins with the Marshallian vision, which emphasizes the geographical aggregate of small and medium-sized enterprises sharing social relations and evolves to the definition that follows: "The industrial district is considered as "a territorial unit characterised by the presence of numerous small and medium-sized enterprises specialised in a specific sector, which collaborate

with each other to create an integrated production system" (Beccatini G., 1989). Other authors (Beccatini, 1998 and Sforzi F., 2005; Sforzi F., 2008) have highlighted the significance of collaborative relationships and networks in creating innovation and competitiveness.

Furthermore the literature has extended the discussion about industrial districts in relation to local and territorial development. Numerous authors have pointed out that districts are not only economic units but also socio-economic units, where the circulation of knowledge and skills leads to the creation of continuous innovative processes. The districts are excellent examples of how specialization can be analyzed from a circular point of view, where resource flows are constantly recycled and utilized within a specific area.

In this context, phenomena such as globalisation and the emergence of new technologies have led to a further evolution of the industrial district concept. The Marshall definition of district, characterized by the geographical concentration of small and medium-sized enterprises specialized in a specific sector, has undergone an adaptation due to the changing economic dynamics and the increasing complexity of the model, highlighting its limitations, with particular reference to its capacity for innovation and adaptation. In this sense, the shift from district to cluster is a crucial step in the analysis of economic spatialization and territorial competitiveness.

For this reason, we refer to the cluster theory developed by Porter, which states that companies are no longer small, specialized realities but rather include large and medium-sized enterprises that are integrated into a productive ecosystem that encompasses the entire service and support sector. Therefore, a complex and interconnected network of relationships that promotes innovation and competitiveness is generated by clusters, which include both direct producers and suppliers, research institutes, training bodies, and public institutions.

In such a system, the importance of relations (both cultural and social) plays an important role in cooperation and sharing of know-how between companies. This promotes the spread of innovation and economic growth, leading industrial districts to withstand even economic crises thanks to the many local and regional policies which support their development and competitiveness (Sforzi F., 2005).

Nevertheless, maintaining the competitive advantages of territorial concentration requires opening up to global markets and integrating district value chains (Grandinetti 2013). Also, in order to maintain a competitive advantage in the long term, a high degree of adaptability to change is required. This is coupled with the growing importance of environmental sustainability issues as the integration of this concept improves the resilience of districts at a global level.

In this synthetical framework, relationships and interactions and collaboration must develop between universities, businesses, and governments as these relationships form the basis for the realization of innovative ecosystems (Lazzeroni M. et al., 2019).

Industrial clusters promote innovation by facilitating social and cultural cohesion, knowledge and skills sharing across districts, and creating an environment that encourages creativity and innovation. So, the development and maintenance of daily interactions between the different actors of the cluster is crucial for the emergence of innovative solutions such as circular economy and industrial symbiosis.

4.3.3 The business model innovation path within circular economy and industrial symbiosis within the Product life cycle.

The traditional balance between customers and suppliers has been altered by advancements in the global economy. The emergence of new communication and computing technologies, along with the establishment of more open global trading systems, has provided customers with increased choices. Varied customer needs can now be expressed, and alternative supply options are more transparent. Consequently, businesses must prioritize a customer-centric approach, particularly since technology enables the cost-effective provision of information and customer solutions. These changes necessitate a re-evaluation of the value propositions offered to customers, as the supply-driven logic of the industrial era is no longer viable in many sectors. This evolving landscape also highlights the importance of not only addressing customer needs effectively but also capturing value through the provision of new products and services. Without a well-developed business model, innovators will struggle to deliver and extract value from their innovations, particularly evident in Internet companies where

revenue generation can be challenging due to customer expectations of free basic services.

A business model serves to articulate the logic and provide evidence of how a business creates and delivers value to customers. It outlines the revenue, cost, and profit structure associated with the delivery of that value. Various elements need to be determined when designing a business model. The design of a good business model involves interconnected issues that lie at the core of the fundamental question asked by business strategists: "How can a sustainable competitive advantage be built to achieve above-average profits?" In essence, a business model defines how an enterprise creates and delivers value to customers and converts received payments into profits. To profit from innovation, business pioneers must excel not only in product innovation but also in designing a business model that aligns with customer needs and technological trends. However, developing a successful business model alone is not enough to ensure a competitive advantage, as imitation is often straightforward. It is crucial to establish a differentiated yet effective and efficient business model that is difficult to replicate, thus increasing the likelihood of generating profits. Business model innovation itself can be a pathway to gaining a competitive advantage if the model is distinct enough to discourage replication by both incumbents and new entrants. The CE is viewed as a development strategy aimed at addressing environmental and economic challenges (Heshmati , 2015). Its objective is to decouple the consumption of goods and services from the extraction of raw materials (Sauvé et al., 2016), thereby reducing waste generation and the depletion of natural resources (Lieder, Rashid A., 2016). The concept of CE is often seen as a means to promote sustainable development (Kirchherr et al., 2017; Velenturf, Purnell P., 2021). The most widely accepted definition of CE, as provided by the Ellen MacArthur Foundation (Geissdoerfer et al., 2017), describes it as "an industrial system that is restorative or regenerative by intention and design" (MacArthur , 2013, p. 7), with a focus on the principles of reduction, recovery, reuse, and recycling of materials, energy, and waste (Heshmati , 2015; Kirchherr, et al., 2017).

The development of CE necessitated a multidisciplinary approach encompassing fields such as ecology, design, economy, and business management, to transition from a linear economy. This shift facilitated the development of eco-innovations that prioritize ecological considerations over anthropocentric perspectives (Ormazabal, M. et al., 2018). According to Prieto-Sandoval et al. (2018: 610), CE comprises four components: "1) the recirculation of resources, 2) a multilevel approach, 3) its significance for sustainable development, and 4) its close relationship with society." Al-Thani and Al-Ansari (2021, p. 1746) also highlight the fundamental role of circularity in CE, as papers discussing and defining CE commonly emphasize the circular flow of materials, energy, and nutrients, highlighting the broad range of applications and the importance of CE (Wishart, et al., 2018).

CE presents new business opportunities and encourages the adoption of innovative solutions for sustainable development (Veleva, Bodkin, 2018). For instance, companies can develop business models that fulfill customer needs through product functionality rather than relying solely on the production and sale of physical goods (Tukker, 2015). This approach reduces material costs and enhances resource efficiency (Tukker A., 2015). However, Jäger and Piscicelli (2021) suggest that effective implementation of CE requires organizations to establish multiple partnerships. These partnerships may involve collaborating with waste collection services for recycling purposes (Chang, et al., 2017), handling the transportation, sorting, and dismantling of used materials (Tate, et al., 2019), and mitigating risks and costs (Veleva, , & Bodkin, 2018).

One of the commonly used frameworks for circularity strategies is the 4R framework, consisting of four strategies: Reduce, Reuse, Recycle, and Recover. In this chapter, the authors propose the addition of a fifth category, Regenerate, to better accommodate start-ups involved in the development of nature-based solutions. Nature-based solutions aim to enhance the utilization of ecosystem services, which encompass the benefits humans derive from ecosystems. Examples of ecosystem services include green roofs or walls and urban green spaces, which rely on a minimal input of nonrenewable natural resources and prioritize renewable natural processes.

The R-list establishes a hierarchical order for waste management methods, with Regenerate given precedence over Reduce, and so on, as the level of circularity decreases down the list. These strategies can be applied within the two types of material cycles characterizing the CE: the biological cycle, which involves the flows of food and biologically based materials (such as cotton and wood) designed to return to the biosphere through processes like composting or anaerobic digestion, and the technical cycle, which pertains to the flows of inorganic or synthetic materials.

Our consumption behaviors have unprecedented impacts on the natural environment (Stern , 2000). As a result of these consumption patterns, society and businesses are faced with a convergence of factors, including environmental degradation, pollution, climate change, social inequity, poverty, and the growing need for renewable energy sources. These factors necessitate a new approach to conducting business (Menon and Menon, Menon, 1997). In response, many companies are acknowledging the need for sustainable business practices, and we observe firms like Interface Carpet, Unilever, Nike, and Starbucks incorporating sustainability into the core of their brands (Hardcastle, 2025). This study reviews the literature on sustainable consumer behavior change and presents a comprehensive psychological framework to guide researchers and practitioners in fostering sustainable behavior.

The CE is gaining momentum in academia, industry, and policymaking as an alternative model that aims to minimize resource depletion, waste, and emissions. Implementing this concept at the organizational level relies on business models as a crucial leverage point. A body of literature has emerged exploring the notions of circular business models and circular business model innovation. However, there is a significant lack of clarity regarding their theoretical conceptualization. To address this gap and systematize the current state of the emerging field of circular business models and circular business model innovation, we conducted a literature review using systematic database searches and cross-reference snowballing. Our contributions to conceptual clarity include an overview of the history of circular business models and circular business model innovation concepts, a synthesis of definitions of circular business models

and circular business model innovation, and an overview and synthesis of conceptual frameworks for circular business models and circular business model innovation.

The concept of the circular business model is built upon two fundamental concepts: the CE and business model innovation. This section provides a brief introduction to both topics.

The idea of the CE draws influence from Boulding's work in 1966, which argued for viewing the Earth as a desirable closed-loop system with the limited assimilative capacity to achieve a balance between the economy and the environment. Stahel and Reday (1976) further developed the concept by focusing on industrial economics and introducing the notion of a loop economy. This concept described strategies for waste prevention, regional job creation, resource efficiency, and the dematerialization of the industrial economy.

Stahel (1982) emphasized the importance of selling utilization rather than ownership of goods as a relevant business model for a loop economy. This approach allows industries to generate profits while reducing costs and risks associated with waste. The contemporary understanding of a CE, introduced by Pearce and Turner (1989), incorporates various features and contributions from different concepts that share the idea of closed loops. These concepts include industrial ecology, cradle-to-cradle, laws of ecology, looped and performance economy, regenerative design, biomimicry, the blue economy, and life cycle management and engineering.

The Ellen MacArthur Foundation, supported by McKinsey, played a significant role in popularizing and shaping the contemporary curated form of the CE concept through influential reports. Since 2013, the concept has gained increasing attention in academia, resulting in a range of different definitions. For example, definitions highlight the circular flow of materials, the design for restoration, and the aim to keep products, components, and materials at their highest utility and value. Kirchherr et al. (2017) reviewed numerous definitions and proposed a comprehensive definition that describes the CE as an economic system based on business models that replace the "end-of-life" concept with reducing, reusing, recycling, and recovering materials. It operates at multiple

levels, including the micro, meso, and macro levels, to achieve sustainable development and create environmental quality, economic prosperity, and social equity for current and future generations.

However, a previous review of CE literature identified shortcomings in this definition, such as oversimplification of the term "end-of-life" and a reduced focus on other lifecycle stages. Therefore, the authors revisited the definitions and adapted a previous definition for this research. For this study, the CE is defined as an economic system in which resource input and waste, emissions, and energy leakages are minimized. In this scenario, the concept of IS provides the chance to enhance and develop business models, while adhering to the principles of the CE. By sharing by-products, companies can establish new relationships and optimizes the use of resources. This interconnection favours the emergence of circular business models, where end-of-life products are reintroduced into a new production cycle. This reduces environmental impacts while generating income and competitive advantages for companies. In this sense, IS promotes innovation within business models and is essential for achieving a more sustainable economy, based on extended life cycle of the products. (Bocken N.,2023).

We cannot ignore the product life cycle (Levitt T., 1965), which describes the trajectory of a product through stages of growth, maturity, and decline, tied to two variables: demand and time. This cycle can also be imagined for graphite as a secondary raw material.

The initial concept of the product life cycle was primarily rooted in the marketing field. Nevertheless, for the concept to evolve, it needed to extend beyond marketing, prompting the emergence of various adaptations of the product life cycle theory outside of this domain, as practitioners from other fields began to incorporate and apply the concept to their own research areas. For example, much of the guidance found in Levitt's (1965) depiction of the market product life cycle extended beyond the marketing scope of that time. In fact, a shift towards a non-marketing emphasis became crucial for the concept to maintain its relevance (Figure 7). Current product offerings were no longer the mere output of a single organization, following the traditional stages of 'life' such as

introduction, growth, maturity, and decline, as described by the conventional M-PLC model. Instead, the validity of this model was questioned due to the operations of modern companies, leading to criticism of the M-PLC's failure to promote interconnections between the phases and its perception of the product as having a relatively fixed lifespan. Contemporary research was moving away from the isolated stages of the product life cycle model, including introduction, growth, maturity, and decline, towards a model that more explicitly considered the value chain and integrated the concept into its own renewal.

This shift began to appear in the mid-1960s and had developed into a distinct field of product life cycle research by the 1970s. As early as 1966, the original product life cycle concept had acquired a political and international aspect through the work of Vernon (1966), who introduced the idea of the 'international product life cycle'—a theory that utilizes economic and locational factors to explain the diffusion and evolution of new product technologies across national borders. In this context, the focus of the life cycle expanded beyond the product itself to include its processes, proposing a life cycle that transferred product technologies from initially 'advanced' countries to eventually 'less developed' ones.

Additionally, Hayes and Wheelwright (1979a, b) began exploring the relationship between the process and product life cycles. They introduced a 'product-process matrix,' with product structure on the x-axis and process structure on the y-axis. Positioned along a diagonal line on this matrix were typical company positions, characterized by each product/process alignment. Companies seeking positions 'off the diagonal' were aiming for a competitive edge (Hayes and Wheelwright 1979a, b). The intent behind this new framework was to provide a strategic perspective: Hayes and Wheelwright created 'a framework that can help a company diagnose its strategic evolution, think creatively about possible future strategic directions, and actively involve both marketing and manufacturing in aligning and executing its competitive objectives' (Hayes and Wheelwright 1979b). They effectively linked the concept of the product life cycle with the process life cycle and utilized this combination to shape strategy.

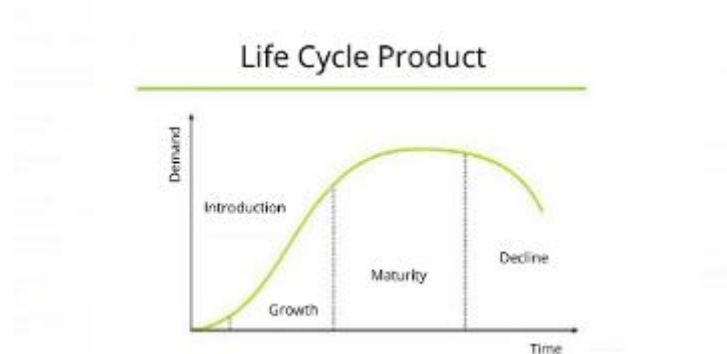


Figure 7: Life Cycle Product. Source: Levitt T. (1965)

4.3.4 Sustainable Business Model Innovation.

To further sustainable and responsible production, environmentally friendly innovations are necessary (Cosenz, F., 2018; De Medeiros, J.F. and Ribero, J.L.D., 2014), along with sustainable supply chains (Linton, J.D. and Klassen, R., 2007) and new business models (BMs) that incorporate the three dimensions of sustainability: social, environmental, and economic (Brehmer, M. et al., 2018). (Brehmer, M. et al., 2018). While there's no single definition of a BM, it can be seen as reflecting "how an organization creates and captures value" (Brehmer, M. et al., 2018, p. 4515). The BM concept became prominent during the dot-com era, leading to new business methods (Nielsen, C.; Lund, M., 2014). BMs can evaluate a company's value chain (Boons, F., 2013) and guide innovative projects (Karlsson, N.P, 2018; Magretta, J., 2002).

Traditional BMs focus on financial performance (Upward, A. and Jones, P.H., 2016), but sustainable business models (SBMs) integrate sustainability to provide a competitive advantage and higher customer value (Sousa-Zomer, T.T. and Miguel, P.A.C., 2018). Initially, SBMs aimed to incorporate sustainability considerations (Sousa-Zomer, T.T. and Miguel, P.A.C., 2018; Rashid, A. et al., 2013; Stubbs, W. and Cocklin, C., 2018), but now they are recognized for their competitive advantage. SBMs differ from traditional BMs by embedding sustainability-related meanings and norms and integrating sustainability into value propositions and related activities (Geissdoerfer, M., 2018).

The SBM literature explores various subcategories and strategies for sustainability, such as product–service systems and circular BMs (Bocken,

N.M.P., 2014). SBMs aim to create sustainable value, engage in proactive multi-stakeholder management, and adopt long-term perspectives while closing, slowing, intensifying, dematerializing, and narrowing resource loops (Brehmer, M., 2018; Bocken, N.M.P., 2014; Ritala, P et al., 2018; Linder, M., 2017). Innovating traditional BMs is crucial for enhancing SBMs (Bocken, N.M.P., 2014), supported by shifting away from purely profit-driven templates (Karlsson, N.P.; Hoveskog, M., 2018; Hellström, M. et al., 2015; Schaltegger, S. et al., 2012). SBMs can offer new combinations of products and services to meet complex customer demands, requiring innovative strategies and stakeholder interaction (Sousa-Zomer, T.T.; Miguel, P.A.C., 2018; Vezzoli, C. et al., 2015). These innovations often involve ideas from outside the firm, linking to the open innovation concept (Bigliardi, B.; Galati, F., 2018; Bogers, M. et al., 2018; Cassiman, B. and Valentini, G. 2016; Chesbrough, H. et al, 2006; Dahlander, L. and Gann, 2010; Enkel, E. et al, 2009; Lopez-Vega, H. et al, 2016; West, J. and Bogers, M., 2017).

BM innovation is the process of designing and implementing novel BMs, starting with business modeling [Hoveskog, M. et al., 2018, p. 4384]. This supports sustainability as a driver of innovation towards sustainable value creation (Brehmer, M. et al., 2018; Bocken, N.M.P. 2014; Pedersen, E.R.G, 2018). Embedding sustainability in BMs involves planning the transformation from one BM to another, enhancing organizational resilience and competitive advantage (Geissdoerfer, M., 2018). BM innovation for sustainability aims to adopt solutions that foster sustainability and reduce negative environmental and social impacts, promoting organizational resilience and prosperity (Geissdoerfer, M., 2018, p. 406). Sustainable production goals are supported by embedding innovation into SBMs, recognizing external factors like society, the environment, the market, and stakeholders in value propositions (Upward, A. and Jones, P.H., 2016; Hoveskog, M. et al., 2018).

4.3.5 The Firm and Its Network: Business and Cross-Sector Collaborations

Collaboration with various actors is essential for successful SBMs (Boons, F. and Lüdeke-Freund, F., 2013; Fadeeva, Z., 2005). A boundary-spanning perspective on BMs can define sustainable organizations that contribute to value creation and

innovation, linking the focal organization with external actors in its network (Zott, C. and Amit R., 2007, 2008 and 2011). This perspective highlights the focal organization's role in enhancing value creation within its network and society (Brehmer, M. et al., 2018).

Network-level analysis in collaborations has been less studied in cross-sector and business network literature [38,39], which often focus on the focal organization. Partnerships and collaborations are intermediate objects of study between single organizations and society, co-constructed through communication among partners and stakeholders towards symbiotic SBMs (Shumate, M. et al, 2018; Shumate, M. and O'Connor, A., 2010). Partner interactions can restructure BMs through collaboration or create entirely new BMs (Dahan, N.M., 2010), with intermediaries playing a crucial role in supporting innovation (Kanda, W, 2018). Cross-sector collaboration can leverage SBM innovation through archetypes like marketing-focused SBMs, regulative SBMs, inclusive SBMs, and social investment SBMs (Aagaard, A. and Lodsgård, L., 2019). Network analysis can represent boundary-spanning value creation and transfer in SBMs (Brehmer, M. et al., 2018), beyond traditional component-based BM representations like Canvas.

The literature on cross-sector partnerships often focuses on single collaborations between businesses and public or non-profit organizations for specific initiatives (Clarke, A.; MacDonald, A., 2019). These partnerships aim to solve economic, social, and environmental problems through cooperation (Crane, A., 1998), emphasizing benefits for the wider community (Skelcher, C. and Sullivan, H. 2002, p. 752). Public–private partnerships are pivotal for large environmental technology systems (Kanda, W., 2016).

Studies have analyzed the stages of cross-sector partnerships, which resemble those in strategic alliances: formation, implementation, and outcome (Seitanidi, M.M.; and Crane, A, 2009; Seitanidi, M.M. and Koufopoulos, D.N., 2010; Selsky, J.W. and Parker, B., 2005). Positive collaboration evolution depends on factors like shared values and absence of opportunistic behavior during formation, and trust and commitment during implementation. These factors impact alliance success, influenced by similarities in size, activities, organizational culture, and

prior alliance experience (Teece, D., 2018; Franco, M., 2011). Relational governance and social capital are crucial for inter-organizational knowledge transfer (Abdi, M. and Aulakh, P.S., 2017; Cao, Z., 2015; Poppo, L. et al. 2008; Lee, Y., 2006; Zaheer, A., 1995; Lin, N. 2001; Mu, J. et al., 2008; Ortiz, B. et al, 2018; Galati, F., 2019; Liu, Y, 2017).

Despite growing attention, little is known about firms engaged in multiple cross-sector partnerships and how these collaborations enhance sustainability performance through SBM evolution.

4.3.6 Innovation circular ecosystems and industrial localization

Innovation in spatially defined context evolved from industrial districts to clusters and recent evolution is towards ecosystems of innovation, that involves circularity. An innovation ecosystem refers to the evolving network of actors, activities, artifacts, institutions, and relationships both complementary and competitive that are essential to the innovative capabilities of an individual or a group. Over the years, the concept has gained popularity, sparking discussions around its relevance and conceptual precision, including within this journal. In this sense, the recent literature, reveals a disproportionate emphasis on complementarities, collaboration, and actors, and advocates for incorporating competition, substitutes, and artifacts to provide a more comprehensive conceptualization. This synthesized definition aligns with related ideas of innovation systems and natural ecosystems(Granstrand, O., & Holgersson, M. 2020).

In this sense, governance is an important element that focuses on rules, policies, and mechanisms that guide the ecosystem's operation. It involves decision-making structures, collaboration, and coordination, ensuring alignment of interests and trust among actors to implement circular policies.

Beyond governance, there is the issue of the actors that make up the innovation ecosystem. In an innovative ecosystem, a network of actors collaborates to innovate and market circular solutions. Six key aspects include:

1. Heterogeneity and Interdependence: Diverse actors with complementary capabilities facilitate problem-solving and reduce conflicts (Tate W. et al., 2019; Parida et al., 2019).
2. Alignment of Interests: Individual and collective interests must converge for circular goals (Konietzko J. et al., 2020a).
3. Roles and Responsibilities: Clearly defining these roles supports ecosystem assessment (Kohtamäki, M. et al., 2019).
4. Reliability: Trust among partners is crucial to facilitate entry of new actors and information sharing (Rajala R. et al., 2018).
5. Balance: An ecosystem requires a sufficient number of actors to ensure resource circularity (Tate et al., 2019).
6. Orchestrator: A key actor coordinates and supports the ecosystem, often a private company or public institution (Rajala R. et al, 2018; Parida V. et al., 2019).

One of the important aspects of innovation ecosystems is that the various actors coordinate their strengths to pursue certain objectives. The three key aspects are:

1. Multiple Activities in Different Domains: For example, optimizing manufacturing processes and enhancing recycling (Rajala, R. et al, 2018).
2. Collective Goals: A shared vision and collective objectives are vital for innovation (Konietzko J. et al., 2020).
3. Economic and Environmental Benefits: Financial returns and environmental improvements are necessary for the ecosystem's success (Stewart R. and Niero M., 2018).

So, the governance of innovation ecosystems plays a crucial role and should not be based on non-hierarchical but on collaborative. e (Seles, B. M. R. P et al., 2022). Unlike traditional supply chains, innovative circular ecosystems offer more autonomy to actors. Rules and standards may be set by government agencies or negotiated by the orchestrator, with the government playing a crucial role in environmental regulation (Chang Y. T. and Hsiesh S.H., 2019; Kohtamäki, M. et al., 2019).

4.4 Methods, the case study, data

4.4.1 Methods

The methodology of this research was based on the search for a qualitative case of a company which realized products using recycled and/or reused materials, in order to obtain a case study that could include a circular business model, thanks especially to the collaboration with the different stakeholders. To highlight the most adapt case study we performed – as it will be more evident below – a literature review, followed by a set of ad-hoc interviews to stakeholders on the main thesis research question, as “how the collaboration between small and medium/large enterprises can be effective in terms of spill-overs of circularity best practices in the business model in a bottom up approach?”. The set of semi-structured interviews with companies involved in innovation and sustainability, led to highlight in Alisea s.r.l one of the best cases to respond to the above mentioned research question. Several of the stakeholders, in fact, in particular suggested checking with Alisea company its positioning on such a topic. That implied, also, involving the CEO of the company into the knowledge transfer process of the present research.

A qualitative approach was employed to investigate how a small business can incorporate circular elements into the business model of a large company.

To select the appropriate case study, we performed different steps. A literature review coupled with a desk research was performed, together with an analysis over selected companies on issues related to CE and IS, before reaching what was thought as the most relevant case study, as that of Alisea company, a small company that uses recycled graphite to insert it into paints, pencils, fashion, and lighting.

The case study method applied in this research represents a strategy that supported the understanding of the dynamics among actors within a specific context (Eisenhardt, K.M., 1989).

Summarizing, the methodology followed the following steps:

1. Literature review - desk research;
2. Qualitative analysis - structured / unstructured questionnaires and interviews on ad-hoc stakeholders;

3. Case study analysis- structured interviews with Alisea personnel and analysis of the case study.

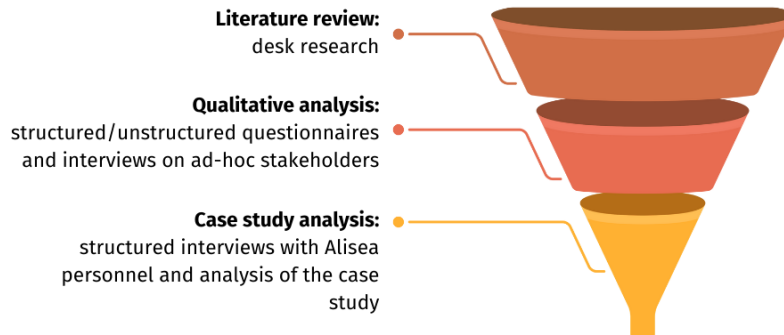


Figure 8: Research methods (Personal elaboration, 2024)

A qualitative exploratory approach is typically chosen to examine singular cases and specific situations (Eisenhardt, K.M., 2007) through an in-depth analysis of the case. Data collection was conducted using qualitative methodologies, including semi-structured interviews with key informants from companies active in CE activities, as well as in innovative operations.

The interviewees were selected through an inverted chain technique – snowball sampling (Patton, M.Q., 2002). Semi-structured interviews employ open-ended questions to foster dialogue between participants and improve the quality of data gathered in an exploratory context (Patton, M.Q., 2002, Miles, M.B, 2007). In the specific case study, they followed two different steps.

A first step required focusing on a set of stakeholders, selected among innovative enterprises, either active in the CE business, or in the innovation sector. These companies were selected after surveying companies active in the business in Italy and particularly Northeastern Italy, holding tight relationships with the innovation framework of the Trieste system environment - University of Trieste, AREA Science park, etc. E

The companies vary in size and belong to different sectors. They were selected because they have different revenues and operate in various sectors, but they are all companies with a very high rate of innovation. In fact, the sample consists of spin-off companies from the University of Trieste, as well as other companies

that manage their business in an innovative way, also in collaboration with the University of Trieste.

These incorporated entrepreneurs, CEOs, and managers and, among these, companies holding important relationships with Alisea.

Such a wide range of interviews was performed to analyze the perception of the CE within local companies during the analysis. The objective was to determine whether these companies were genuinely working on projects related to the CE and IS or implementing sustainable practices in that direction. Through our interactions with different actors in the industry, we have been able to narrow down the research field and focus on the company we are studying.

A second step involved interviews with selected stakeholders gradually delving into Alisea's chief executive officer (CEO), who was interviewed several times to track the development of the company's partnerships.

Qualitative methodologies, including semi-structured interviews were then targeted to Alisea and its partners, such as material suppliers, subcontractors, clients, non-profit organizations, public sector bodies, and other collaborators. The interviews were based on a guide structured around four key areas: sustainability-driven innovation, business models in the CE, partnerships and networks, and Alisea's role within these collaborations. The interview framework was tailored according to the key informant's position within Alisea's complex network. Each interview aimed to enhance our understanding of the nature of the relationships established between Alisea and its partners, the diffusion process, and the critical factors affecting this transfer and the evolution of the sustainable business model (SBM).

In addition to interviews, the company provided multiple annual reports and videos about its various collaboration lines, which allowed for clear elaboration and interpretation of the information. Triangulating collected data and validating information that emerged during interviews was made possible by the solid empirical basis provided by the literature review.

The reason for choosing this approach is that it allows for a thorough analysis of the company's dynamics (both internal and external), with the aim of analyzing in depth the strategies adopted by the company.

4.4.2 The Study Area

An example of such evolution can be observed in the Veneto Region, where industrial districts, identified and defined on a quantitative and territorial basis, have now undergone a transformation towards the concept of clusters. In this case, the emphasis of regional policies has shifted from the geographical concentration of enterprises to a wider perspective that encompasses various economic and institutional actors in terms of sustainable and integrated development.

According to the literature, excessive specialization and a lack of diversification have caused many districts to struggle with adapting during this transition. The challenge today consists in integrating innovation, territorial development, and circularity in new clusters, creating favorable conditions for economic, environmental, and social development, exploiting the resources of the territory, and promoting the regeneration of material flows, energy, and knowledge. Adapting regional policies to national regulations for industrial districts is crucial for the economic development of industrial areas.

Law 317/91 recognized industrial districts as territorial aggregates of enterprises that focus on production specialization, and they collaborate to share knowledge and create an environment conducive to economic growth. This law provided the basis for recognition and support to businesses in the district. Subsequently, Law 266/1997 allowed the regions to identify industrial districts but also to implement specific policies, where the regions have gained greater importance in defining and implementing industrial district policies. Thus, each region has defined its own regulations and instruments for industrial districts, adapting the national regulations to the specificity of the territory and local production chains.

Veneto region is an example of how it has developed programs to internalize districts and facilitate entry into foreign markets.

As already mentioned, the industrial districts in the Veneto region represent a form of aggregation between enterprises which have developed over the years in a given territory, becoming an example of how local companies and institutions can develop a strategic project capable of driving forward the development of districts, in accordance with regulations and with the Regional Innovative

Networks (R.I.R.). An innovation ecosystem is created by these initiatives that brings together enterprises, research and knowledge dissemination bodies, both public and private, within the regional framework and develop initiatives that are functional to the technological and organizational evolution of the production and industrial system in Veneto.

A map depicting the current districts of Venice and the location of the Alisea s.r.l enterprises, which are the focus of this research, is shown below.

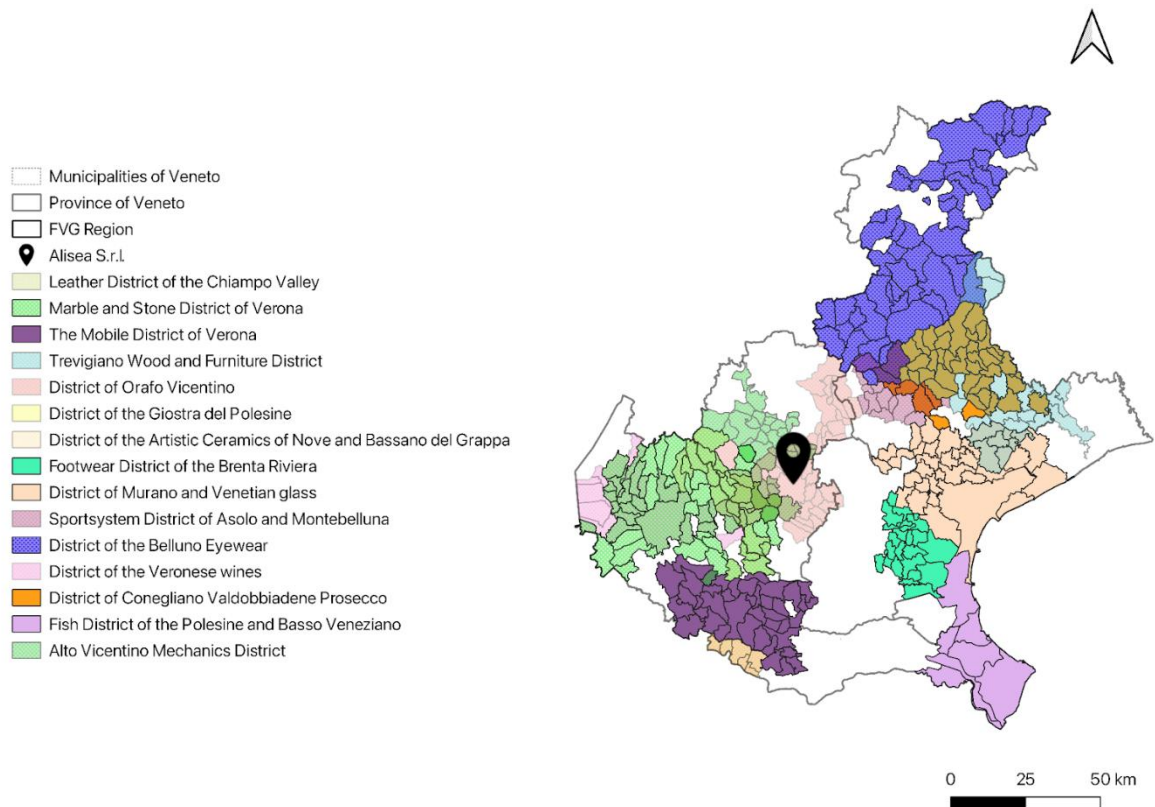


Figure 9: Veneto Industrial Districts (personal elaboration, 2024 data source: <https://www.innoveneto.org/distretti-industriali/>)

The RIR is made up of companies, research centers, and public entities that are found in the regional territorial fabric. By utilizing a multisectoral approach and working closely with companies and research institutions, they tackle innovative and transdisciplinary themes and present relevant projects to the region. Industrial districts that combine excellence, tradition, Made in Italy, territoriality, knowledge, manufacturing, production specialization, and RIRs' drive towards research and innovation, which brings together knowledge, intelligent

specialization, technological trends, frontier ecosystems, transversality, and multidisciplinary, represent an excellent combination. By creating a production system, they can compete globally in sectors such as advanced mechanics, fashion, agriculture, and home systems. To make the region more competitive, the RIRs leverage the knowledge and skills of the entrepreneurial community and the research world to address global innovation challenges. Their cooperation on the frontier of innovation is achieved through research and development projects in different fields:

1. Smart Agrifood
2. Smart Health
3. Smart Manufacturing
4. Smart Living & Energy
5. Culture & creativity
6. Intelligent Destination.

4.4.2 The Case study: Alisea s.r.l

Alisea s.r.l is located in the industrial district of Veneto. The emblem of the company is the production of the “matita perpetua”, a product that shows how the company integrates the principles of IS and CE within its production processes. Alisea Recycled and Reused Objects Design, based in Northern Italy, provides B2B gadgets and promotional items. Founded in 1994 by Susanna Martucci, Alisea emphasizes environmental sustainability, aiming to transform waste into valuable products. Martucci's vision was to focus on the value represented by recycled materials rather than just the products themselves.

The aim was to investigate different areas such as the company's circular business model implemented and their different networks of collaboration. Thanks to these interviews, it was also possible to retrieve numerous additional materials such as annual reports written by the company and videos in which were narrate the company's projects in progress, improving the understanding of the case study and the connections in which it is embedded.

Moreover, industrial clusters are a characteristic of the region where it is located, where companies collaborate and share resources, skills, and knowledge to

enhance efficiency and innovation. Alisea benefited from this collaborative environment because it collaborates with several local companies to procure recycled materials that would otherwise be considered as waste. As an example, the “matita perpetua” is made with graphite powders from industrial processing waste that are recovered and reused. Such process allows the minimization of waste and lowering of raw material supply costs. Moreover, this strategy allows the company to transform production waste into valuable resources, thus promoting a more sustainable production cycle. In accordance with CE principles, extending the useful life of materials and minimizing waste, it is a good example of how businesses can thrive in a sustainable way, contributing to the well-being of the entire local community.

4.4.3 The Data

The analysis on the case study was performed using a different dataset. Results from questionnaires and interviews were vital in focusing on the main topics and focal points of the company in tackling CE and IS in particular.

This was realized thanks to a set of contacts had with companies active in innovation in Northeastern Italy. In particular, interviews with ITS - International Talent Support led to focusing on Alisea company as a virtuous example of IS. A set of contacts and interviews were therefore realized with the founder & CEO (Tab. 3).

Interview organization	Interviewed Role	Interview Date
International Talent Support (ITS)	Founder	06/05/2024
International Talent Support (ITS)	Founder	11/06/2024
Alisea s.r.l.	Founder & CEO	24/06/2024
Alisea s.r.l.	Founder & CEO	28/06/2024
Alisea s.r.l.	Founder & CEO	16/07/2024
Alisea s.r.l.	Founder & CEO	25/07/2024

Table .3: Record of interviews

Over than interviews, ALISEA provided company’s relevant information and documents, as well as contacts with the other players in the circularity business. Different datasets were therefore used to obtain the useful information for reconstructing the circular, symbiothical business model (Tab. 4).

From the analysis performed on the different datasets (company information, business data, interviews’ outcomes) an interesting framework of CE and IS emerges.

Desk research - Data used for the analysis	
Alisea website	https://alisea.it/
Pencil Perpetua website	https://www.perpetua.it/
Listone Giordano presents Graphit	https://materialicasa.it/materiali/pavimenti-e-rivestimenti/listone-giordano-presenta-graphit
Geo&Geo - interview - Susanna Martucci - Producing from waste- 26/01/2024	https://www.raiply.it/video/2024/01/Susanna-Martucci---Produrre-dagli-scarti---Geo---26012024-4afaa19d-2002-469e-a8b4-20440433cb17.html?wt_mc=2.app.oth.raiply_prg_Geo.&wt
Arclinea website	https://arclinea.com/it/journal/clp-g-cover.html
Cosetex website	https://www.cosetex.it/blog/tessuto-seta-grafite/
Recurring Questions during the interviews	
	How important is it to collaborate with a large company?
	To what extent does a large company seek to play the role of orchestrator, and to what extent is there a risk that it might appropriate the innovation?
	How crucial is it to invest in innovation?

Table 4: Data used during the analysis and recurrent questions.

4.5 Results

4.5.1 The 'Perpetua' Revolution

In 2012, Alisea created the 'Perpetua' pencil in response to a customer request to use graphite powder waste from electrode production. Finding no Italian pencil manufacturers, Alisea became the first by introducing this innovative product. Named 'Perpetua' after a character in Alessandro Manzoni's novel, it symbolizes longevity compared to traditional pencils. Made of 80% recycled graphite and

non-toxic materials, Perpetua pioneered "self-cycling"—each pencil consumes 15g of recycled graphite. Perpetua pencils, accompanied by a history-telling cardboard, are custom-made for major brands like Star Wars, Audi, and the Taormina G7 meeting.



Figure 10: Perpetua pencil (Source: Alisea s.r.l.)

The pencil's environmental sustainability is matched by economic benefits. Using recycled graphite lowers production costs, unlike expensive virgin materials. The electrode producer, Tecno EDM, also saves on waste disposal costs. Initially skeptical, Tecno EDM was impressed by the successful creation of Perpetua, which turned waste into a globally recognized product, fostering a strong partnership based on transparency, reciprocity, and trust.

Perpetua's supply chain includes cross-sector collaborations with social cooperatives such as Agape and Alice. Agape employs people with severe disabilities to handle packaging, shipping, and e-commerce, while Alice employs incarcerated women to produce pencil cases. These partnerships enhance Perpetua's social and economic sustainability by creating jobs and distributing economic value at market rates. Alisea's entrepreneur promotes these cooperatives, enhancing their visibility and potential for further collaboration.

The relationship with Agape, based on shared values and mutual trust, showcases a commitment to social responsibility. Similarly, the partnership with Alice extends beyond commercial interactions, creating a "dialogue space" where both parties share goals and celebrate mutual successes. This collaboration aims to amplify sustainable practices and inspire new environmental solutions.

Perpetua's social mission includes educational projects for environmental and cultural awareness. Collaborating with Archimedia, Perpetua's story is told through a theatrical show and school workshops, teaching students the importance of environmental care through practical actions. Additionally, Alisea and Perpetua serve as case studies for the CE in universities and professional seminars.

4.5.2 Alisea's Business Model and Initial Collaborations

To counter competition from foreign countries, particularly those located in Southeastern Asia, characterized by lower production costs and a fierce competition over different markets, Alisea chose to produce affordable, high-quality, eco-friendly items characterized by one-of-a-kind green stories. They maintained Italian production, asking partner companies for their waste materials to reduce costs and innovate. This approach led to a CE model where production waste from one company becomes raw material for another.

Alisea's SBM involves two types of circular processes:

1. Upcycling: Using virgin materials to create new products (e.g., vases from tomato peels and wax).
2. Recycling: Transforming waste into entirely new items (e.g., pens from recycled car lights).



Figure 11: G_upgrade recycled graphite (Source: Alisea s.r.l)

Economic sustainability is key; Alisea doesn't purchase waste materials, and benefits are shared within the supply chain. Design and aesthetics are crucial to compete with new products. The objects retain the memory of their past, emphasizing creativity and sustainability.

The need for diverse products led Alisea to partner with numerous small, artisan firms. These collaborations enhanced Alisea's reputation and expanded its customer base. Not all suppliers accepted this model, resulting in a natural selection of innovative, collaborative partners.

4.5.3 Network and Collaboration

Alisea's network strength is attributed to Martucci's motivation and competence. Their continuous innovation attracted major organizations like WWF, New Holland, and Volkswagen. Alisea's staff and suppliers benefited mutually from shared know-how and experimentation with new materials.

An example of effective networking is the project with Banca Popolare di Milano, where Alisea recycled plastic cups into money boxes, involving bank employees and other stakeholders in the recycling process. This project also had an educational component, promoting environmental responsibility.

Alisea's curiosity and willingness to tackle new challenges are fundamental. They collaborate with like-minded suppliers, believing that "nothing is impossible."

The cross-sector collaborations, such as the 'Goodness Minerva' project initiated by Savignano sul Panaro's mayor, exemplify Alisea's SBM. This project involved local schools and families in waste collection, benefiting the municipality, school, and environment.

Alisea's SBM is characterized by innovation, sustainability, and strong collaborative networks, enhancing its market position and driving continuous growth.

4.6 Discussion

This section details the evolution of Alisea's Sustainable Business Model (SBM) alongside the growth of its partnership network, highlighting three key periods. These phases are not strictly separate, as Alisea's different business activities coexist and mutually support the firm and its collaborative network.

As a result, the data used for research includes both interviews conducted by authors and company documents, which have led to a better understanding of the case study, which provides robustness and validity to the results.

Alisea designs all a set of projects aimed at tackling recycled materials, nonetheless production is entrusted to subcontractors in the Vicenza area. In such a sense, the company and its network of contractors, subcontractors and partner companies are well inserted into the industrial production framework of the Italian industrial districts, that, in the recent past as noticed above, characterized a different way of production based on local knowledge and expertise exploitation and sharing. If we examine the evolution of the business model, we see that Alisea began its business by creating corporate communication gadgets using recycled materials, all in an effort to compete with foreign manufacturers. This continued until a client asked them to dispose of graphite, which was a production waste from electrode manufacturing. From this project, Perpetua was born, a pencil made from recycled graphite. The creation of Perpetua, which accounted for approximately 50% of Alisea's revenue in 2023,

led to further research into the material to understand additional fields of application. The studies revealed that graphite could be applied in the fields of paints, clothing, and lighting. However, in these highly innovative fields, we do not have economic information because the patents were licensed out in 2023.

Alongside the core business of the company, at the current stage, Alisea, in order to provide innovative elements to the business models of larger companies, is fully leveraging the potential of graphite as an innovative direction where development and innovation efforts are oriented. As previously noticed in this chapter, the creation of the perpetual pencil is only the first step in using graphite across various fields, ranging from paints and textiles to lighting solutions.

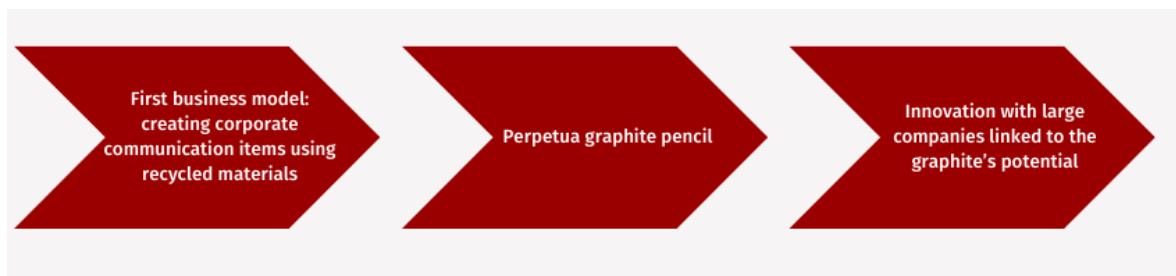


Figure 12: Alisea's business model evolution over time

In this image, we see how Alisea's business model has evolved. It transitioned from producing corporate communication items made from recycled materials (as shown in the first step) to designing Perpetua, a recycled graphite pencil for which an iconic design was developed (as depicted in step two). The business model then further evolves into bringing innovation into the business models of large companies by fully leveraging the diverse potential of graphite (step 3).

Company name	Company dimension	Production Value 2022	Production Value 2021
Alisea s.r.l.	Small-medium	1.436.368€	897.233€
Margaritelli S.p.A	Big	198.006.930€	176.260.559€
Arclinea S.p.A	Small-medium	40.482.516€	37.444.237€
Cosetex s.r.l	Small-medium	5.947.201€	6.393.671€

Table 5: Production value of Alisea S.r.l. and its partner companies between 2021 and 2022

As we can see, Alisea actively collaborates with companies of various sizes to create innovative products using graphite. For instance, they work with the Margaritelli SpA group, owner of the Listone Giordano brand, to develop non-toxic graphite-based paints; a similar collaboration takes place with Arcliea. Meanwhile, with Cotex, they collaborate on the creation of fabrics that contain graphite.

The collaboration between Alisea and its partners must clearly bring an advantage to all parties involved. To ensure maximum protection of the research results, the parties that actively participated in the research have decided to patent the outcomes or seek trademark protection. Typically, the collaboration works as follows: Alisea provides the company with its graphite expertise, which is then developed together with the partners according to their needs. For example, in the case of Listone Giordano, a water-based paint was created that, by using the properties of graphite, makes the paint scratch-resistant. As mentioned earlier, once the research is completed, a patent is filed in which each party is credited with their inventive contribution. At this point, if the Margaritelli group uses the patented paint, they must pay royalties to Alisea, turning research and innovation into a true business activity. This type of research conducted with various partners allows Alisea to maintain its independence without being subject to acquisition by a larger entity.

Certainly, collaboration between large and small companies, as just mentioned, also presents some risks. The first, as mentioned earlier, is the loss of autonomy or being acquired when collaborating with a single, much larger entity. Another risk not to be underestimated is that the larger company might attempt to appropriate the intellectual property of the smaller entity. In this case, the only way to avoid the loss of intellectual property is through solid legal counsel from the outset.

The attention towards innovation in finding a new life to materials, becoming second raw materials for other production, the continuous research towards new opportunities tailored to fit customers and partners' needs in terms of unique production, led the Alizea company as a case study to implement a business model based on circularity and industrial symbiotal concepts. As it is summarized in Tab. 6, graphite-based products represent the first-of-the-kind family of products representing an innovation on the market, exploiting a brand new production and business model. As the product life cycle - as above presented -generally follows a descending path after reaching maturity, the overall availability of potential second raw materials allows - theoretically - to overcome the declining phase and start again a new production. In such a sense, the potential exist to surfing innovation following in a growing path, allowing the company to remain constantly on a start-up, innovation stage to rapidly adapt to changing market conditions. While there might be concerns about the sustainability of this focus on graphite, a closer analysis reveals that Alisea is not only capitalizing on the capabilities of graphite but is also actively exploring a wide range of other materials. This strategic experimentation positions the company to discover new avenues of innovation, potentially leading to breakthroughs with alternative materials that could complement or even replace graphite in its innovation journey. Below is a list of the materials that Alisea is currently working with.

MATERIAL	DESCRIPTION	ADVANTAGES
Paper	Alisea Agendas are made from 100% recycled paper, free from chlorine or derivative substances, and printed with eco-friendly soy-based inks.	They are "Printed with the sun," a label we use because they are produced exclusively in print shops powered by state-of-the-art photovoltaic systems, saving approximately 460,000 kg of CO2 annually. No trees were cut down to produce the paper used for Alisea's Eco-Agendas.
Cotton	Cotton is a plant fiber obtained from the mature capsules of the plant and has been used since ancient times, not only for clothing but also for making lightweight and breathable bags for storing rice, grains, flour, and salt.	Unfortunately, after centuries of success, there has been a decline, making the production of cotton food bags extremely rare."
Plastic	From the proper recovery and recycling of plastic bottles comes a pen that "didn't exist before." The recycled PET used is sourced from a circular economy and is 100% recyclable (post-consumer). The entire production process to obtain recycled PET is patented worldwide.	AQUA is durable, writing for 2500 meters. It comes with a smear-resistant refill available in black or blue. The design of AQUA is patented and bears the recycling mark and "Made in Italy" stamp. All pens have the inscription "I was a 500 ml bottle." AQUA is the collective result of an ethical, 100% Italian supply chain where partners, from transporters to material processors, to producers and distributors, share the same philosophy and mission: environmental and human care for a truly sustainable future.
Aluminium	HY-LITE is an innovative composite material made of two thin sheets of aluminum and a white polypropylene core. Like steel, aluminum can be bent, drilled, cut, milled, stamped, printed, and screen-printed but weighs 30% less than aluminum and 65% less than steel. HY-LITE offers high resistance and flexibility and, thanks to the polypropylene core, can be folded up to 80,000 times. HY-LITE is printable and customizable with embossing, screen printing, and high-definition digital printing. HY-LITE objects can be made in various sizes, shapes, and internal mechanisms according to customer requests. Alisea's collection includes original, elegant, and highly durable items such as ring binders, clipboards with pen holders and brochure pockets, agendas, address books, CD holders, organizers, and boxes.	HY-LITE is fully recyclable. Through cryogenic fragmentation, aluminum and polypropylene components separate easily, becoming reusable.
Leather	The R cuoio line uses a material obtained from leather shaving waste, vegetable-tanned with the addition of natural rubber latex. It feels pleasant, soft, and elastic, like the original raw material. Alisea's collection includes various items, from work folders to bags, clipboards, notebooks, and pen holders. These items speak of design, technical skill, craftsmanship, and elegance. R cuoio is available in anthracite gray (from dark leather processing waste) and Havana (from light leather processing waste).	"Choosing an item from Alisea's R cuoio range means not contributing to the consumption of virgin raw materials, particularly of animal origin." "Working with leather processing waste was one of Alisea's first challenges because, living in Vicenza, we knew the tanning industry well and the amount of inevitable waste from this process. Finding a creative way to use a material that was previously destined exclusively for internal support structures of leather goods seemed like an opportunity for us to develop sustainable design by transforming perceived waste into value. This goal was quickly achieved thanks to a collaboration with an artisan who, recognizing the potential of this material, had been experimenting with its reuse for some time. An enlightened entrepreneur with whom we began an interesting collaboration that allowed us to present the first R cuoio items in the late 1990s."
Rubber	From the recovery and reuse of racing bike tires come Alisea Cycled rubber accessories. Each item is entirely produced in Italy, from raw material collection to packaging. Bicycle tires are fully reused, even the	Bicycle tires are fully reused, even the cuttings. Every year in Italy, about 2 million bicycle tires are discarded, amounting to about 700 tons of waste

	cuttings. Each item is entirely produced in Italy, from raw material collection to packaging.	destined for landfills and incinerators. Small actions can make a difference.
Fabric	Fabrics were among the first products that humans have recycled since ancient times, transforming rags into precious material for paper production. A recent market survey indicates that in Italy in 2012, 99,900 tons of textile waste were collected separately, about 1.6 kg/person annually, equal to 12% of the total recyclable; a figure significantly lower than the European average. An opportunity not to be missed because, instead of being discarded, end-of-life textiles could be transformed into recycled products for use in various industrial sectors, such as automotive, marine, furniture, or insulating panels for construction. A mutually beneficial relationship between those who have waste to eliminate and those who have a need to fulfill.	"We believe Alisea's work can help develop greater awareness of the potential of textiles, which allows great flexibility in transformation and reuse. Waste, production scraps, and warehouse surplus are not synonymous with waste to be disposed of but with quality and valuable material no longer usable for the original purpose."

Table. 6: Materials used by Alisea s.r.l.

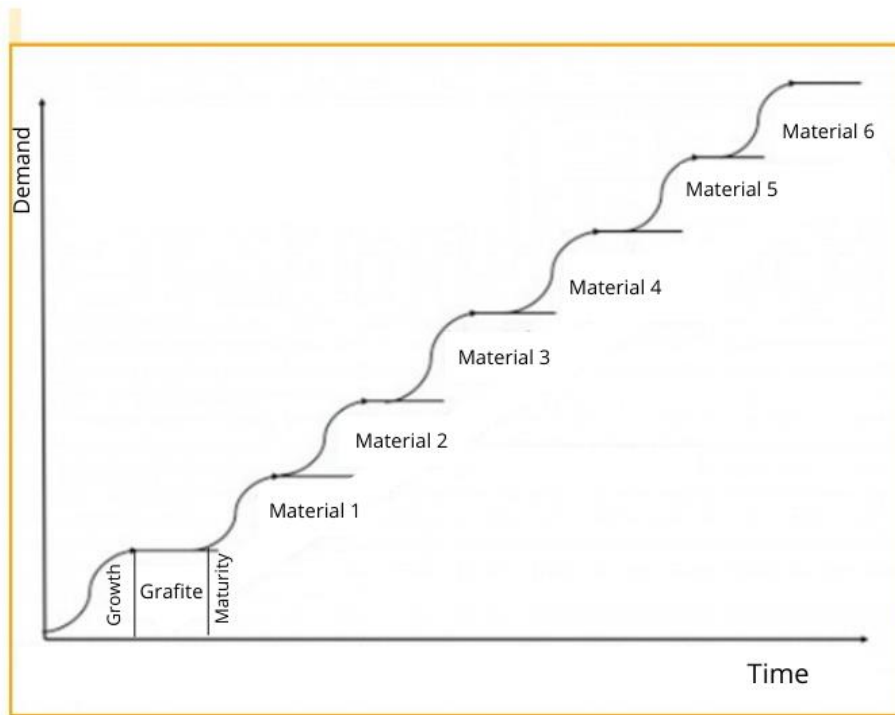


Figure 13: The product life cycle in a constant innovation path (Personal elaboration, 2024)

Summarizing, it becomes increasingly evident that by continuing its research and development efforts, Alisea has a truly significant potential for innovation. This potential can be offered to larger companies, which often lack the flexibility to swiftly explore and integrate such a diverse range of materials. Alisea's agility in experimenting with and developing these materials allows it to serve as a valuable partner to these companies, enabling them to benefit from cutting-edge

innovations without the need to divert their own resources into areas where they may not have the same level of expertise or adaptability.

What emerges, in fact, is that Alisea can serve as an important vehicle for innovation for large companies. Indeed, Alisea's size allows it to focus on research aimed at fostering innovation. As previously mentioned, it is not Alisea itself that directly implements this innovation; rather, as in the case of graphite, it is the large companies that take advantage of it by incorporating elements of circularity into their business models. As noted above, given the variety of materials on which Alisea conducts research, the company possesses a wide set of materials for innovation, which it can then make available to pursue further and future business evolution.

4.7 Conclusions

CE and IS has recently become important concepts to be studied and implemented within the firms' business models, with particular reference to how innovation is managed and organized in such contexts. The key aspect analysed in the present research regarded how innovation in CE and particularly in IS can be fostered in the small innovative enterprises' business models and how this can benefit the cooperation among small / medium enterprises and big companies. As by the literature review and by surveying innovation-related companies on the issues at stake, together with universities and research centres, there is still little evidence of existing cooperation between companies in fostering joint, other than independent, CE and IS projects, as well as developing ad hoc ones. From such a survey, however, an interesting case study arose, where a small/medium size company (Alisea), focusing on a circular economical business model, developed products based on recycled materials, leveraging synergies with bigger companies in industrial symbiotal collaborations. In particular we have seen how, in order to survive intense competition from Asia, Alisea was compelled to change its business model by shifting its focus to material research, which it then offered to its clients, thereby avoiding price-based competition. This new business philosophy has led Alisea to share its innovations with larger companies

that, due to their size and organizational rigidity, struggled to innovate independently.ther large enterprises.

As discussed above, Alisea was founded as a company focused on creating corporate communication products from recycled materials. Following several discussions with the founder appear clear the decision to produce communication items from recycled materials stemmed from the need to differentiate from other producers of corporate communication products and to counter the constant influx of items from developing and newly industrialized countries, as China and all of the other countries, particularly located in South East of Asia, that are fiercing challenging the Western consolidated markets from. This exploration of materials led to a study on graphite, which initially resulted in the creation of Perpetua. Perpetua is the only pencil made in Italy from recycled graphite. The creation of Perpetua has led to a series of collaborations with companies such as Listone Giordano (Margaritelli Group) and Arclinea in the field of coatings, and with Cosetex in the field of textiles. Through these types of collaborations, Alisea becomes a driver of innovation, introducing elements of circularity into these large companies.

This is an example of how a small company that has invested in innovation, by collaborating with larger companies, can introduce elements of circularity into the business models of larger companies. These models tend to be more rigid from a structural standpoint compared to the business models of smaller companies. The main findings from the case study highlight a significant gap in awareness among companies regarding the opportunities that coexist in co-developing circular economic processes, especially between companies of varying sizes. The Alisea case study aligns neatly with the academic frameworks discussed in the literature review, reinforcing the theoretical principles established by prior research. However, one of the most notable findings is the urgency to enhance the awareness of larger companies about the potential benefits of integrating circularity into their business models. This awareness is critical not only for fostering collaboration with smaller enterprises but also for unlocking new market opportunities that can arise from sustainable practices. By embracing circularity, larger companies can catalyze innovation, drive efficiency, and contribute to a

more sustainable economic landscape. Hence, targeted initiatives and educational efforts are essential to bridge this awareness gap, enabling larger firms to realize the strategic advantages associated with circular economic practices.

5. General Conclusions

This research provides a detailed analysis of the shift from traditional to circular business models within innovation ecosystems, underscoring a significant transformation in business practices toward sustainability. The study reveals that companies increasingly recognize the value of circular business models that prioritize long-term resource efficiency and regeneration over the conventional linear approach of extraction, production, and disposal. This transformation marks an evolution from isolated business strategies to a more interconnected and ecosystem-based approach to innovation.

A central finding of the study is the role of circular innovation ecosystems, where businesses do not operate in isolation but are embedded within collaborative networks involving multiple stakeholders such as companies, research institutions, policymakers, and consumers. These networks emphasize the importance of collaboration to maximize shared knowledge and resources. Essential to the success of these ecosystems are orchestrators key actors responsible for coordinating the interactions among various participants. Orchestrators align stakeholder interests and facilitate cooperation, thereby enabling the ecosystem to function cohesively. Their role directly relates to stakeholder theory, which stresses the importance of considering the interests of all parties involved in a business. In circular innovation ecosystems, orchestrators play a mediating role, ensuring that the value created through circular practices is fairly distributed among stakeholders. This equitable distribution enhances the resilience and cohesion of the ecosystem by fostering trust and long-term commitment among its members. The literature indicates that as these ecosystems mature, they encourage significant business model innovation through the promotion of knowledge sharing, cross-sector partnerships, and the capacity for systemic change focused on sustainability.

The survey conducted for this research sheds light on the dynamics of relationships between small and large companies within the context of the circular economy. Findings indicate that a substantial number of companies are aware of circular economy principles and recognize the need to transition from traditional

linear production models characterized by the “take, make, dispose” approach—to sustainable models emphasizing waste reduction, material reuse, and resource recycling. This shift in perspective represents a foundational step toward developing a sustainable business landscape that seeks to decouple economic growth from finite resource consumption. Notably, the survey findings suggest that companies are open to collaboration with other stakeholders to advance circular economy projects, viewing cooperative networks as a way to amplify the impact of circular practices.

A particularly promising insight from the survey is that many companies prefer to collaborate with universities and research institutions to integrate circularity into their business models. This trend indicates a growing recognition of the importance of scientific knowledge, technical expertise, and research-driven innovation in achieving sustainable business transformation. Universities and research centers provide access to advanced technologies, new methodologies, and skilled talent, all of which can help companies design circular products, optimize processes, and minimize their environmental impact. These collaborations also offer insights into recent advances in materials science, waste management, and life-cycle assessment—essential components for effective circular strategies.

Despite the high level of interest in collaboration, the research highlights a gap between intention and action. Although many companies express a desire to participate in circular projects, only one company, among the one surveyed, Alisea, has managed to establish robust, ongoing collaborations to implement circular economy elements in its business model. Alisea exemplifies a leading figure in this space, showcasing how strategic partnerships can provide a valuable example for other companies striving to deepen their sustainability efforts. Through continuous investment in research and development (R&D), Alisea has maintained a competitive edge by staying at the forefront of innovative technologies and practices that enable circular operations. By embedding circular economy concepts across its operations from product design to supply chain management Alisea highlights the importance of sustained commitment to

exploring new opportunities and adapting to emerging trends in circular innovation.

The case study of Alisea serves as an important model for understanding the benefits of leveraging strategic alliances in circular business practices. Alisea's success in driving circular innovation stems from its ability to establish synergies with larger companies through industrial symbiotic collaborations. These partnerships have enabled Alisea to introduce circular elements into the business models of larger firms, which are often more structurally rigid. Initially, Alisea differentiated itself by producing corporate communication products from recycled materials, which led to the development of innovative products like the Perpetua pencil, made entirely from recycled graphite. This unique product catalyzed collaborations with prominent companies such as Listone Giordano and Cosetex in fields ranging from coatings to textiles. Through these partnerships, Alisea has positioned itself as a driver of circular innovation, enabling larger enterprises to integrate circularity into their traditionally linear models.

This case exemplifies how smaller companies that prioritize R&D and pursue innovative practices can significantly influence the sustainability strategies of larger companies. Alisea's focus on material research as a means of avoiding price-based competition with lower-cost producers highlights how small firms can differentiate themselves and collaborate effectively with larger organizations. By sharing its innovations with larger companies that may struggle to implement circular practices independently, Alisea demonstrates the value of a cooperative approach to the circular economy, in which both small and large firms contribute to a sustainable business environment.

Overall and as a general conclusion, this study shows that while there is high awareness of the circular economy among the companies surveyed, there is considerable variability in their ability to implement these practices effectively. Alisea stands out as a pioneering company due to its strategic partnerships and sustained focus on research and innovation. To replicate this success, other companies must bridge the gap between intention and action, which can be

achieved by developing deeper collaborations with academic institutions and committing to long-term R&D. As circular economy principles continue to gain traction globally, companies that invest in these areas will be better equipped to adapt, grow sustainably, and remain competitive in an increasingly resource-constrained market.

This research contributes to the academic literature on the circular economy and inter-company relationships, particularly regarding how circular and innovation ecosystems can promote sustainable transformations within business models. Future studies should further explore how principles of the circular economy and industrial symbiosis can be integrated into diverse business sectors, with a focus on the role of orchestrators in facilitating sustainable economic growth. The insights from this study underscore the importance of cooperative innovation ecosystems for advancing circular practices, thereby emphasizing the strategic role of orchestrators and stakeholder theory in enabling long-term success in sustainable business practices.

Furthermore, it appears that many companies, regardless of size, have not yet fully embraced the principles of the circular economy. The absence of widespread practices and frameworks for implementing circular strategies suggests a significant gap in both research and real-world application.

However, it is worth mentioning that there are exceptions, such as the case of Alisea, which demonstrates the potential for collaboration between different-sized companies to foster innovation and implement circular economy principles effectively. This case underscores the importance of building partnerships that leverage the strengths of both large and small enterprises, potentially leading to more sustainable business models.

To fully realize the benefits of the circular economy, it is essential for future research to focus on developing collaborative frameworks and strategies that can facilitate partnerships between various stakeholders. By doing so, we can pave the way for more robust practices that not only promote sustainability but also drive innovation and economic growth across industries.

References

- (<https://www.innoveneto.org/distretti-industriali/>)
- *A systematic, tool-supported method for conducting literature reviews in information systems*. Paper presented at the Proceedings of the 19th European Conference on Information Systems (ecis 2011); June 9 to 11; Helsinki, Finland. 2011.
- A., Helms, M.M., 2021. Redesigning supply chains using blockchain-enabled circular economy and COVID-19 experiences. *Sustain. Prod. Consum.* 27, 10–22. doi:10.1016/j.spc.2020.10.019.
- Aagaard, A.; Lodsgård, L. Leveraging sustainable business model innovation through business–NGO collaboration. In *Sustainable Business Models Innovation, Implementation and Success*; Aagaard, A., Ed.; Palgrave-Macmillan: Basingstoke, UK, 2019; pp. 211–238.
- Abdi, M.; Aulakh, P.S. Locus of uncertainty and the relationship between contractual and relational governance in cross-border interfirm relationships. *J. Manag.* 2017, 43, 771–803.
- Achterberg, E., Hinfelaar, J., Bocken, N.M.P., 2016. *Master Circular Business Models with the Value Hill*. White paper, September 2016
- Adner, R., 2006. Match your innovation strategy to your innovation ecosystem. *Havard Bus. Rev.* 84 (98). doi:10.4337/9780857939913.00007.
- Adner, R., 2017. Ecosystem as structure: an actionable construct for strategy. *J. Manage.* 43, 39–58. doi:10.1177/0149206316678451.
- Adner, R., Kapoor, R., 2010. Value Creation in innovation ecosystems: how the structure of technological interdependence affects firm performance in new technology generations.
- Afuah, A.: *Business model innovation: concepts, analysis, and cases*. Routledge (2014).
- Aloui, S., Zghibi, A., Mazzoni, A., Elomri, A., & Al-Ansari, T. *Groundwater for Sustainable Development*.
- Al-Thani, N.A., Al-Ansari, T., 2021. Comparing the convergence and divergence within industrial ecology, circular economy, and the energy-water-food nexus based on resource management objectives. *Sustain. Prod. Consum.* 27, 1743– 1761. doi:10.1016/j.spc.2021.04.008.
- Aminoff, A., Valkokari, K., Antikainen, M., & Kettunen, O.: *Exploring disruptive business model innovation for the circular economy*. In *Sustainable Design and Manufacturing 2017: Selected papers on Sustainable Design and Manufacturing 4* (pp. 525-536). Springer International Publishing (2017).
- Ammenwerth E., de Keizer N. An inventory of evaluation studies of information technology in health care. *Trends in evaluation research*,

- 1982-2002. *International Journal of Medical Informatics*. 2004;44(1):44–56. [[PubMed](#)]
- Andal-Ancion, A., Cartwright, P. A., & Yip, G. S.: The digital transformation of traditional business. *MIT Sloan Management Review*. 26-32 (2003).
 - Andersen, M. S.: An introductory note on the environmental economics of the circular economy. *Sustainability science*, 2(1), 133-140 (2007).
 - Anderson S., Allen P., Peckham S., Goodwin N. Asking the right questions: scoping studies in the commissioning of research on the organisation and delivery of health services. *Health Research Policy and Systems*. 2008;6(7):1–12. [[PMC free article](#)] [[PubMed](#)] [[CrossRef](#)]
 - Antikainen, M., & Valkokari, K.: A framework for sustainable circular business model innovation. *Technology Innovation Management Review*, 6(7) (2016).
 - Antikainen, M., Valkokari, K., 2016. A Framework for Sustainable Circular Business Model Innovation. *Technol. Innov. Manag. Rev.* 6, 5–12. doi:10.22215/timreview/ 1000.
 - Archer N., Fevrier-Thomas U., Lokker C., McKibbin K. A., Straus S.E. Personal health records: a scoping review. *Journal of American Medical Informatics Association*. 2011;18(4):515–522. [[PMC free article](#)] [[PubMed](#)]
 - Arksey H., O'Malley L. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*. 2005;8(1):19–32.
 - Arrow, K. J.: *The limits of organization*. WW Norton & Company (1974).
 - Aversa, P., Haefliger, S., & Reza, D. G.: Building a winning business model portfolio. *MIT Sloan Management Review*, 58(4), 49-54 (2017).
 - Bacq S and Aguilera R.V., Stakeholder Governance for Responsible Innovation: A theory of value creation, appropriation, and distribution, *Journal of Management Studies* 59:1 January 2022
 - Baines, T. S., Lightfoot, H. W., Benedettini, O., & Kay, J. M.: The servitization of manufacturing: A review of literature and reflection on future challenges. *Journal of manufacturing technology management*, 20(5), 547-567 (2009).
 - Balletto, G., Borruso, G., & Mei, G. (2019). Location theory and circular economy. Demolition, constructions and spatial organization of firms—an applied model to Sardinia Region. The case study of the New Cagliari Stadium. In *Computational Science and Its Applications—ICCSA 2019: 19th International Conference, Saint Petersburg, Russia, July 1–4, 2019, Proceedings, Part III* 19 (pp. 535-550). Springer International Publishing.
 - Baumeister R. F., Leary M.R. Writing narrative literature reviews. *Review of General Psychology*. 1997;1(3):311–320.
 - Becattini, G. (1989). Riflessioni sul distretto industriale marshalliano come concetto socio-economico. *Stato e mercato*, 111-128.

- Becker L. A., Oxman A.D. In: Cochrane handbook for systematic reviews of interventions. Higgins J. P. T., Green S., editors. Hoboken, nj: John Wiley & Sons, Ltd; 2008. Overviews of reviews; pp. 607–631.
- Berman, S. J.: Digital transformation: opportunities to create new business models. *Strategy & leadership*, 40(2), 16-24 (2012).
- Bertassini, A.C., Zanon, L.G., Azarias, J.G., Gerolamo, M.C., Ometto, A.R., 2021. Circular Business Ecosystem Innovation: a guide for mapping stakeholders, capturing values, and finding new opportunities. *Sustain. Prod. Consum.* 27, 436–448. doi:10.1016/j.spc.2020.12.004.
- Beuren, F. H., Ferreira, M. G. G., & Miguel, P. A. C.: Product-service systems: a literature review on integrated products and services. *Journal of cleaner production*, 47, 222-231 (2013).
- Bi, Z. M., Liu, Y., Baumgartner, B., Culver, E., Sorokin, J. N., Peters, A., ... & O'Shaughnessey, S.: Reusing industrial robots to achieve sustainability in small and medium-sized enterprises (SMEs). *Industrial Robot: An International Journal* (2015)..
- Bieger, T., & Reinhold, S.: Das wertbasierte Geschäftsmodell—ein aktualisierter Strukturierungsansatz. *Innovative Geschäftsmodelle*, 13-70 (2011).
- Bigliardi, B.; Filippelli, S. Investigating Circular Business Model Innovation through Keywords Analysis. *Sustainability* 2021, 13, 5036
- Bigliardi, B.; Galati, F. An open innovation model for SMEs. In *Researching Open Innovation in SMEs*; Frattini, F., Usman, M., Roijakkers, N., Vanhaverbeke, W., Eds.; World Scientific Publishing: Singapore, 2018; pp. 71–113.
- Birkin, F., Polesie, T., & Lewis, L. : A new business model for sustainable development: an exploratory study using the theory of constraints in Nordic organizations. *Business Strategy and the Environment*, 18(5), 277-290 (2009).
- Blomsma, F., & Brennan, G. : The emergence of circular economy: a new framing around prolonging resource productivity. *Journal of industrial ecology*, 21(3), 603-614 (2017).
- Bocken, N. M., De Pauw, I., Bakker, C., & Van Der Grinten, B.: Product design and business model strategies for a circular economy. *Journal of industrial and production engineering*, 33(5), 308-320 (2016).
- Bocken, N. M., Ritala, P., Huotari, P.: The circular economy: exploring the introduction of the concept among S&P 500 firms. *Journal of Industrial Ecology*, 21(3), 487-490 (2017).
- Bocken, N. M., Schuit, C. S., & Kraaijenhagen, C.: Experimenting with a circular business model: Lessons from eight cases. *Environmental innovation and societal transitions*, 28, 79-95 (2018).

- Bocken, N. M., Short, S. W., Rana, P., & Evans, S.: A literature and practice review to develop sustainable business model archetypes. *Journal of cleaner production*, 65, 42-56 (2014).
- Bocken, N., Short, S., Rana, P., & Evans, S.: A value mapping tool for sustainable business modelling. *Corporate Governance* (2013).
- Bocken, N., Strupeit, L., Whalen, K., & Nußholz, J.: A review and evaluation of circular business model innovation tools. *Sustainability*, 11(8), 2210 (2019).
- Bocken, N.M.P.; Short, S.W.; Rana, P.; Evans, S. A literature and practice review to develop sustainable business model archetypes. *J. Clean. Prod.* 2014, 65, 42–56
- Bogers, M.; Chesbrough, H.; Moedas, C. Open innovation: Research, practices, and policies. *Calif. Manag. Rev.* 2018, 60, 5–16.
- Boons, F., & Lüdeke-Freund, F.: Business models for sustainable innovation: state-of-the-art and steps towards a research agenda. *Journal of Cleaner production*, 45, 9-19 (2013).
- Borenstein M., Hedges L., Higgins J., Rothstein H. Introduction to meta-analysis. Hoboken, nj: John Wiley & Sons Inc; 2009.
- Borruso, G., Balletto, G., Murgante, B., Castiglia, P., & Dettori, M. (2020). Covid-19. Diffusione spaziale e aspetti ambientali del caso italiano. *Semestrale di studi e ricerche di geografia*, 32(2), 39-56.
- Boulding, K. E.: *Economics and ecology* (1966).
- Brehmer, M.; Podoyntsyna, K.; Langerak, F. Sustainable business models as boundary-spanning systems of value transfers. *J. Clean. Prod.* 2018, 172, 4514–4531.
- Brennan, G., Tennant, M., & Blomsma, F.: *Business and production solutions: closing loops and the circular economy* (2015).
- Bressanelli, G., Adrodegari, F., Perona, M., & Saccani, N.: The role of digital technologies to overcome Circular Economy challenges in PSS Business Models: an exploratory case study. *Procedia Cirp*, 73, 216-221 (2018).
- Bressanelli, G., Adrodegari, F., Perona, M., Saccani, N., 2018. Exploring How Usage Focused Business Models Enable Circular Economy through Digital Technologies. *SUSTAINABILITY* 10. doi:10.3390/su10030639.
- Brown, P.; Bocken, N.; Balkenende, R. Why Do Companies Pursue Collaborative Circular Oriented Innovation? *Sustainability* 2019, 11, 635
- Brown, P.; Von Daniels, C.; Bocken, N.M.P.; Balkenende, A.R. A Process Model for Collaboration in Circular Oriented Innovation. *J. Clean. Prod.* 2021, 286, 12549
- Burrows, P. (2009). Microsoft defends its empire. *Business Week*, 28.

- Calisto Friant, M., Vermeulen, W.J.V, Salomone, R., 2021. Analysing European Union circular economy policies : words versus actions. *Sustain. Prod. Consum.* 27, 337–353. doi:10.1016/j.spc.2020.11.001.
- Cantele, S., Moggi, S., & Campedelli, B. (2020). Spreading sustainability innovation through the co-evolution of sustainable business models and partnerships. *Sustainability*, 12(3), 1190.
- Cao, Z.; Lumineau, F. Revisiting the interplay between contractual and relational governance: A qualitative and meta-analytic investigation. *J. Oper. Manag.* 2015, 33, 15–42.
- Casadesus-Masanell, R., & Ricart, J. E.: From strategy to business models and onto tactics. *Long range planning*, 43(2-3), 195-215 (2010).
- Casadesus-Masanell, R., & Zhu, F.: Business model innovation and competitive imitation: The case of sponsor-based business models. *Strategic management journal*, 34(4), 464-482 (2013).
- Cassiman, B.; Valentini, G. Open innovation: Are inbound and outbound knowledge flows really complementary? *Strat. Man. J.* 2016, 37, 1034–1046.
- Chesbrough, H., & Rosenbloom, R. S.: The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Industrial and corporate change*, 11(3), 529-555 (2002).
- Chesbrough, H.: Business model innovation: it's not just about technology anymore. *Strategy & leadership*, 35(6), 12-17 (2007)..
- Chesbrough, H.; Vanhaverbeke, W.; West, J. (Eds.) *Open Innovation: Researching a New Paradigm*; Oxford University Press: Oxford, UK, 2006.
- Christensen, C. M., & Overdorf, M.: Meeting the challenge of disruptive change. *Harvard business review*, 78(2), 66-77 (2000).
- Christensen, C. M., & Rosenbloom, R. S.: Explaining the Attacker's Advantage: Technological Paradigms, Organizational Dynamics, and the Value Network☆ This chapter is a reprint of the article “Explaining the attacker’s advantage: technological paradigms, organizational dynamics, and the value network” published in the *Research Policy* Volume 24 Issue 2 (1995). In *Collaboration and Competition in Business Ecosystems*. Emerald Group Publishing Limited (2014).
- Clarke, A.; MacDonald, A. Outcomes to partners in multi-stakeholder cross-sector partnerships: A resource-based view. *Bus. Soc.* 2019, 58, 298–332
- Clarysse, B., Wright, M., Bruneel, J., & Mahajan, A.: Creating value in ecosystems: Crossing the chasm between knowledge and business ecosystems. *Research policy*, 43(7), 1164-1176 (2014).

- Cook D. J., Mulrow C. D., Haynes B. Systematic reviews: Synthesis of best evidence for clinical decisions. *Annals of Internal Medicine*. 1997;126(5):376–380. [[PubMed](#)]
- Cooper H. M. Organizing knowledge syntheses: A taxonomy of literature reviews. *Knowledge in Society*. 1988;1(1):104–126.
- Cooper H., Hedges L.V. In: *The handbook of research synthesis and meta-analysis*. 2nd ed. Cooper H., Hedges L. V., Valentine J. C., editors. New York: Russell Sage Foundation; 2009. Research synthesis as a scientific process; pp. 3–17.
- Cosenz, F.; Noto, G. A dynamic business modelling approach to design and experiment new business venture strategies. *Long Range Plan*. 2018, 51, 127–140.
- Cronin P., Ryan F., Coughlan M. Undertaking a literature review: a step-by-step approach. *British Journal of Nursing*. 2008;17(1):38–43. [[PubMed](#)]
- Dahan, N.M.; Doh, J.P.; Oetzel, J.; Yaziji, M. Corporate-NGO collaboration: Co-creating new business models for developing markets. *Long Range Plan*. 2010, 43, 326–342
- Dahlander, L.; Gann, D.M. How open is innovation? *Res. Pol.* 2010, 39, 699–709.
- Dantas, T.E.T., de-Souza, E.D., Destro, I.R., Hammes, G., Rodriguez, C.M.T., Soares, S.R., 2021. How the combination of Circular Economy and Industry 4.0 can contribute towards achieving the Sustainable Development Goals. *Sustain. Prod. Consum.* 26, 213–227. doi:10.1016/j.spc.2020.10.005.
- Darlow S., Wen K.Y. Development testing of mobile health interventions for cancer patient self-management: A review. *Health Informatics Journal*. 2015 (online before print). [[PubMed](#)] [[CrossRef](#)]
- Daudt H. M., van Mossel C., Scott S.J. Enhancing the scoping study methodology: a large, inter-professional team’s experience with Arksey and O’Malley’s framework. *bmc Medical Research Methodology*. 2013;13:48. [[PMC free article](#)] [[PubMed](#)] [[CrossRef](#)]
- David P. Lepak, Ken G. Smith and M. Susan Taylor, Value Creation and Value Capture: A Multilevel Perspective, *The Academy of Management Review* Vol. 32, No. 1 Jan., 2007, pp. 180-194
- Davies P. The relevance of systematic reviews to educational policy and practice. *Oxford Review of Education*. 2000;26(3-4):365–378.
- De Giacomo, M.R., Bleischwitz, R., 2020. Business models for environmental sustainability: contemporary shortcomings and some perspectives. *Bus. Strateg. Environ.* 29, 3352–3369. doi:10.1002/bse.2576.

- De Medeiros, J.F.; Ribeiro, J.L.D.; Cortimiglia, M.N. Success factors for environmentally sustainable product innovation: A systematic literature review. *J. Clean. Prod.* 2014, 65, 76–8
- Deeks J. J., Higgins J. P. T., Altman D.G. In: *Cochrane handbook for systematic reviews of interventions*. Higgins J. P. T., Green S., editors. Hoboken, nj: John Wiley & Sons, Ltd; 2008. Analysing data and undertaking meta-analyses; pp. 243–296.
- Deshazo J. P., Lavallie D. L., Wolf F.M. Publication trends in the medical informatics literature: 20 years of “Medical Informatics” in mesh. *bmc Medical Informatics and Decision Making*. 2009;9:7. [[PMC free article](#)] [[PubMed](#)] [[CrossRef](#)]
- Dixon-Woods M., Agarwal S., Jones D., Young B., Sutton A. Synthesising qualitative and quantitative evidence: a review of possible methods. *Journal of Health Services Research and Policy*. 2005;10(1):45–53. [[PubMed](#)]
- Donner, M., Gohier, R., de Vries, H., 2020. A new circular business model typology for creating value from agro-waste. *Sci. Total Environ.* 716, 137065. doi:10.1016/j.scitotenv.2020.137065.
- Dyck, B., & Silvestre, B. S. (2018). Enhancing socio-ecological value creation through sustainable innovation 2.0: Moving away from maximizing financial value capture. *Journal of cleaner production*, 171, 1593-1604.
- Ebeling, C. E.: Evolution of a Box. *Invention and Technology*, 23(4), 8-9 (2009).
- Eisenhardt, K.M. Building theories from case study research. *Acad. Manag. Rev.* 1989, 14, 532–550.
- Ellen Macarthur Foundation, E., 2013. *Towards the Circular Economy: economic and business rationale for an accelerated transition*, Ellen Macarthur Foundation. doi:10.1162/108819806775545321.
- Elo, S., Kyngäs, H., 2008. The qualitative content analysis process. *J. Adv. Nurs.* 62, 107–115. doi:10.1111/j.1365-2648.2007.04569.x.
- Enkel, E.; Gassmann, O.; Chesbrough, H. Open R&D and open innovation: Exploring the phenomenon. *R&D Man.* 2009, 39, 311–316.
- Evidence-based information systems: A decade later. *Proceedings of the European Conference on Information Systems*; 2011. Retrieved from <http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1221&context=ecis2011>.
- Fadeeva, Z. Promise of sustainability collaboration—Potential fulfilled? *J. Clean. Prod.* 2005, 13, 165–174
- Fernandes, S.C., Pigosso, D.C.A., Mcaloone, T.C., Rozenfeld, H., 2020. Towards product-service system oriented to circular economy : a systematic review of value proposition design approaches.

- Finfgeld-Connett D., Johnson E.D. Literature search strategies for conducting knowledge-building and theory-generating qualitative systematic reviews. *Journal of Advanced Nursing*. 2013;69(1):194–204. [[PMC free article](#)] [[PubMed](#)]
- Franco, M. Determining factors in the success of strategic alliances: An empirical study performed in Portuguese firms. *Eur. J. Int. Manag.* 2011, 5, 608–632.
- Frankenberger, K.; Weiblen, T.; Csik, M.; Gassmann, O. The 4I-Framework of Business Model Innovation: A Structured View on Process Phases and Challenges. *Int. J. Prod. Dev.* 2013, 18, 249–273
- Freeman, Strategic management: A stakeholder approach. Marshfield, MA7 Pittman Publishing, R. E. 1984.
- Friedmann, J. (1979). On the contradictions between city and countryside. In *Spatial inequalities and regional development* (pp. 23-45). Dordrecht: Springer Netherlands.
- Galati, F.; Bigliardi, B. Redesigning the model of the initiation and evolution of inter-firm knowledge transfer in R&D relationships. *J. Know. Manag.* 2019, 23, 2039–2066.
- Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy—A new sustainability paradigm?. *Journal of cleaner production*, 143, 757-768.
- Geissdoerfer, M.; Morioka, S.N.; de Carvalho, M.M.; Evans, S. Business models and supply chains for the circular economy. *J. Clean. Prod.* 2018, 190, 712–721.
- Geissdoerfer, M.; Vladimirova, D.; Evans, S. Sustainable Business Model Innovation: A Review. *J. Clean. Prod.* 2018, 198, 401–416
- Gomes, L.A.de V., Facin, A.L.F., Salerno, M.S., Ikenami, R.K., 2018. Unpacking the Innovation Ecosystem Construct: Evolution, Gaps and Trends, *Technological Forecasting and Social Change*. Elsevier Inc doi:10.1016/j.techfore.2016.11. 009.
- Gould, P. R. (1969). *Spatial Diffusion*, Resource Paper No. 4.
- Grady B., Myers K. M., Nelson E. L., Belz N., Bennett L., Carnahan L. ... Guidelines Working Group. Evidence-based practice for telemental health. *Telemedicine Journal and E Health*. 2011;17(2):131–148. [[PubMed](#)]
- Granstrand, O., Holgersson, M., 2020. Innovation ecosystems: a conceptual review and a new definition. *Technovation* 90–91. doi:10.1016/j.technovation.2019. 102098.
-
- Green B. N., Johnson C. D., Adams A. Writing narrative literature reviews for peer-reviewed journals: secrets of the trade. *Journal of Chiropractic Medicine*. 2006;5(3):101–117. [[PMC free article](#)] [[PubMed](#)]

- Greenhalgh T., Wong G., Westthorp G., Pawson R. Protocol–realist and meta-narrative evidence synthesis: evolving standards (rameses). *bmc Medical Research Methodology*. 2011;11:115. [[PMC free article](#)] [[PubMed](#)]
- Guo, M., 2018. Multi-scale system modelling under circular bioeconomy, *Computer Aided Chemical Engineering*. Elsevier Masson SAS. doi:10.1016/B978-0-444-64235-6.50146-7.
- Guroi-Urganci I., de Jongh T., Vodopivec-Jamsek V., Atun R., Car J. Mobile phone messaging reminders for attendance at healthcare appointments. *Cochrane Database System Review*. 2013;12 cd007458. [[PMC free article](#)] [[PubMed](#)] [[CrossRef](#)]
- Hagerstrand, T. (1968). Innovation diffusion as a spatial process.
- Hakanen, E., Rajala, R., 2018. Material intelligence as a driver for value creation in IoT-enabled business ecosystems.
- Hardcastle, K., Edirisingha, P., Cook, P., & Sutherland, M. (2025). The co-existence of brand value co-creation and co-destruction across the customer journey in a complex higher education brand. *Journal of Business Research*, 186, 114979.
- Hart C. *Doing a literature review: Releasing the social science research imagination*. London: SAGE Publications; 1998.
- *Harv. Bus. Rev.* 71, 75–86.
- Harvey, D. (2005). The sociological and geographical imaginations. *International journal of politics, culture, and society*, 18, 211-255.
- Hellström, M.; Tsvetkova, A.; Gustafsson, M.; Wikström, K. Collaboration mechanisms for business models in distributed energy ecosystems. *J. Clean. Prod.* 2015, 102, 226–236
- Heshmati, A. (2017). A review of the circular economy and its implementation. *International Journal of Green Economics*, 11(3-4), 251-288.
- Higgins J. P. T., Green S., editors. *Cochrane handbook for systematic reviews of interventions: Cochrane book series*. Hoboken, nj: Wiley-Blackwell; 2008.
- Hofmann, F.; Jaeger-Erben, M. Organizational Transition Management of Circular Business Model Innovations. *Bus. Strategy Environ.* 2020, 29, 2770–2788
- Homrich, A.S., Galvão, G., Abadia, L.G., Carvalho, M.M., 2017. The circular economy umbrella: trends and gaps on integrating pathways. *J. Clean. Prod.* 175, 525–543. doi:10.1016/j.jclepro.2017.11.064.
- Hoveskog, M.; Halila, F.; Mattsson, M.; Upward, A.; Karlsson, N. Education for sustainable development: Business modelling for flourishing. *J. Clean. Prod.* 2018, 172, 4383–4396

- Hsieh, Y.C., Lin, K.Y., Lu, C., Rong, K., 2017. Governing a sustainable business ecosystem in Taiwan's circular economy: the story of spring pool glass. *Sustainability* 9. doi:10.3390/su9061068.
- <https://bur.regione.veneto.it/BurvServices/pubblica/DettaglioDgr.aspx?id=230107>
- <https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview>
- <https://www.regione.veneto.it/web/attivita-produttive/distretti-reti-e-aggregazioni-lr132014>
- https://www.researchgate.net/publication/367023438_Business_models_for_Sustainability
- Iansiti, M., Levien, R., 2004. Strategy as Ecology. *Harv. Bus. Rev.* 82.
- Jacobides, M.G., Cennamo, C., Gawer, A., 2018. Towards a theory of ecosystems. *Strateg. Manag. J.* 39, 2255–2276. doi:10.1002/smj.2904.
- Jäger, J. K., & Piscicelli, L. (2021). Collaborations for circular food packaging: The set-up and partner selection process. *Sustainable Production and Consumption*, 26, 733-740.
- Jäger, J.K., Piscicelli, L., 2021. Collaborations for circular food packaging : the set-up and partner selection process. *Sustain. Prod. Consum.* 26, 733–740. doi:10.1016/j.spc.2020.12.025.
- Jesson J., Matheson L., Lacey F.M. *Doing your literature review: traditional and systematic techniques.* Los Angeles & London: SAGE Publications; 2011.
- Johansson, P., & Olhager, J. (2006). Linking product–process matrices for manufacturing and industrial service operations. *International Journal of Production Economics*, 104(2), 615-624.
- Kanda, W.; Hjelm, O.; Clausen, J.; Bienkowska, D. Roles of intermediaries in supporting eco-innovation. *J. Clean. Prod.* 2018, 205, 1006–1016.
- Kanda, W.; Sakao, T.; Hjelm, O. Components of business concepts for the diffusion of large scaled environmental technology systems. *J. Clean. Prod.* 2016, 128, 156–167.
- Karlsson, N.P.; Hoveskog, M.; Halila, F.; Mattsson, M. Early phases of the business model innovation process for sustainability: Addressing the status quo of a Swedish biogas-producing farm cooperative. *J. Clean. Prod.* 2018, 172, 2759–2772.
- King W. R., He J. Understanding the role and methods of meta-analysis in IS research. *Communications of the Association for Information Systems.* 2005;16:1.
- Kirchherr J., Reike, D. & Hekkert, M. Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling* 127, 221–232 (2017)

- Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, conservation and recycling*, 127, 221-232.
- Kirchherr, J., Yang, N. H. N., Schulze-Spüntrup, F., Heerink, M. J., & Hartley, K. (2023). Conceptualizing the circular economy (revisited): an analysis of 221 definitions. *Resources, Conservation and Recycling*, 194, 107001.
- Kirkevoid M. Integrative nursing research — an important strategy to further the development of nursing science and nursing practice. *Journal of Advanced Nursing*. 1997;25(5):977–984. [[PubMed](#)]
- Kitsiou S., Paré G., Jaana M. Effects of home telemonitoring interventions on patients with chronic heart failure: an overview of systematic reviews. *Journal of Medical Internet Research*. 2015;17(3):e63. [[PMC free article](#)] [[PubMed](#)]
- Kitsiou S., Paré G., Jaana M. Systematic reviews and meta-analyses of home telemonitoring interventions for patients with chronic diseases: a critical assessment of their methodological quality. *Journal of Medical Internet Research*. 2013;15(7):e150. [[PMC free article](#)] [[PubMed](#)]
- Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H., & Baines, T. (2019). Digital servitization business models in ecosystems: A theory of the firm. *Journal of Business Research*, 104, 380-392.
- Konietzko, J., Bocken, N., & Hultink, E. J. (2020). Circular ecosystem innovation: An initial set of principles. *Journal of Cleaner Production*, 253, 119942
- Konietzko, J., Bocken, N., Hultink, E.J., 2020b. A tool to analyze, ideate and develop circular innovation ecosystems. *Sustain* 12, 14–17. doi:10.3390/SU12010417.
- Kouhizadeh, M., Zhu, Q., Sarkis, J., 2020. Blockchain and the circular economy: potential tensions and critical reflections from practice. *Prod. Plan. Control* 31, 950–966. doi:10.1080/09537287.2019.1695925.
- Kuusisto, M., 2017. Organizational effects of digitalization: a literature review. *Int. J. Organ. Theory Behav.* 20, 341–362.
- Langen, P.W.de, Sornn-Friese, H., Hallworth, J., 2020. The role of port development companies in transitioning the port business ecosystem; the case of port of Amsterdam’s circular activities. *Sustain* 12, 4397. doi:10.3390/su12114397.
- Lieder, M., Rashid, A., 2016. Towards circular economy implementation: a comprehensive review in context of manufacturing industry.
- Lazzeroni, M., Morazzoni, M., & Paradiso, M. (2019). Nuove geografie dell’innovazione e dell’informazione. Dinamiche, trasformazioni, rappresentazioni. *GEOTEMA*, 59, 1-164.

- Lee, Y.; Cavusgil, S.T. Enhancing alliance performance: The effects of contractual-based versus relational-based governance. *J. Bus. Res.* 2006, 59, 896–905.
- Levac D., Colquhoun H., O'Brien K. K. Scoping studies: advancing the methodology. *Implementation Science.* 2010;5(1):69. [[PMC free article](#)] [[PubMed](#)]
- Levitt, T. (1965). *Exploit the product life cycle* (Vol. 43). Cambridge, MA, USA: Graduate School of Business Administration, Harvard University.
- Levy Y., Ellis T.J. A systems approach to conduct an effective literature review in support of information systems research. *Informing Science.* 2006;9:181–211.
- Liberati A., Altman D. G., Tetzlaff J., Mulrow C., Gøtzsche P. C., Ioannidis J. P. A. et al. Moher D. The prisma statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *Annals of Internal Medicine.* 2009;151(4):W-65. [[PubMed](#)]
- Lieder, M., & Rashid, A. (2016). Towards circular economy implementation: a comprehensive review in context of manufacturing industry. *Journal of cleaner production*, 115, 36-51.
- Lin, N.; Cook, K.S.; Burt, R.S. (Eds.) *Social Capital: Theory and Research*; Transaction Publishers: Piscataway, NJ, USA, 2001.
- Linder, M.; Williander, M. Circular business model innovation: Inherent uncertainties. *Bus. Strateg. Environ.* 2017, 26, 182–196.
- Linton, J.D.; Klassen, R.; Jayaraman, V. Sustainable supply chains: An introduction. *J. Oper. Manag.* 2007, 25, 1075–1082.
- Liu, Y.; Li, Y.; Shi, L.H.; Liu, T. Knowledge transfer in buyer-supplier relationships: The role of transactional and relational governance mechanisms. *J. Bus. Res.* 2017, 78, 285–293.
- Lopez-Vega, H.; Tell, F.; Vanhaverbeke, W. Where and how to search? Search paths in open innovation. *Res. Pol.* 2016, 45, 125–136.
- Lyden J. R., Zickmund S. L., Bhargava T. D., Bryce C. L., Conroy M. B., Fischer G. S. et al. McTigue K. M. Implementing health information technology in a patient-centered manner: Patient experiences with an online evidence-based lifestyle intervention. *Journal for Healthcare Quality.* 2013;35(5):47–57. [[PubMed](#)]
- Ma, Y., Rong, K., Mangalagiu, D., Thornton, T.F., Zhu, D., 2018. Co-evolution between urban sustainability and business ecosystem innovation: evidence from the sharing mobility sector in Shanghai.
- MacArthur Foundation, Ellen, 2019. Artificial intelligence and the circular economy: Ai as a tool to accelerate. Report 39.
- MacArthur, E. (2013). Towards the circular economy. *Journal of Industrial Ecology*, 2(1), 23-44.

- Madsen, H.L., 2020. Business model innovation and the global ecosystem for sustainable development.
- Magretta, J. Why business models matter. *Harv. Bus. Rev.* 2002, 80, 86–92.
- Manag. J. 2007, 50, 25–32. [[Google Scholar](#)] [[CrossRef](#)]
- Mäntymäki, M., Salmela, H., Turunen, M., 2018. Do business ecosystems differ from other business networks? The case of an emerging business ecosystem for digital real-estate and facility services. In: in Book: *Challenges and Opportunities in the Digital Era*, pp. 102–116. doi:10.1007/978-3-030-02131-3_11.
- Marshall A. (1919) “Industry and Trade. A study of industrial technique and business organization”, London, Macmillan & Co.
- Massaro, M., Brescia, V., Secinaro, S., Calandra, D., Mas, F.D., 2021. Industry 4 . 0 and circular economy : an exploratory analysis of academic and practitioners. *Perspectives (Montclair)* 1213–1231. doi:10.1002/bse.2680.
- Menon, A., & Menon, A. (1997). Enviropreneurial marketing strategy: The emergence of corporate environmentalism as market strategy. *Journal of marketing*, 61(1), 51-67.
- Mickan S., Atherton H., Roberts N. W., Heneghan C., Tilson J.K. Use of handheld computers in clinical practice: a systematic review. *bmc Medical Informatics and Decision Making*. 2014;14:56. [[PMC free article](#)] [[PubMed](#)]
- Miles, M.B., Huberman, M., Saldaña, J., 2014. *Qualitative Data Analysis: a Methods Sourcebook*, Third.
- Miles, M.B.; Huberman, A.M.; Saldaña, J. *Qualitative Data Analysis: A Methods Sourcebook*; SAGE: London, UK, 2014. [[Google Scholar](#)]
- Miles, R., Miles, G., Snow, C., Blomquist, K., & Rocha, H.: *Business Models, Organizational Forms, and Managerial Values*. Working paper, UC Berkeley, Haas School of Business (2009).
- Moher D. The problem of duplicate systematic reviews. *British Medical Journal*. 2013;347(5040) [[PubMed](#)] [[CrossRef](#)]
- Montori V. M., Wilczynski N. L., Morgan D., Haynes R. B., Hedges T. Systematic reviews: a cross-sectional study of location and citation counts. *bmc Medicine*. 2003;1:2. [[PMC free article](#)] [[PubMed](#)]
- Moore, J.F., 1993. Predators and prey: a new ecology of competition.
- Morrill, R. L. (1970). The shape of diffusion in space and time. *Economic Geography*, 46(sup1), 259-268.
- Mu, J.; Peng, G.; Love, E. Interfirm networks, social capital, and knowledge flow. *J. Know. Manag.* 2008, 12, 86–100.
- Mulrow C. D. The medical review article: state of the science. *Annals of Internal Medicine*. 1987;106(3):485–488. [[PubMed](#)] [[CrossRef](#)]

- Mulrow, C.D., 1994. Rationale for systematic reviews. *Bmj* 309, 597–599. doi:10.2323/jgam.35.151.
- Nandi, S., Sarkis, J., Aghaei, Murray A. T., Location Theory. *International Encyclopedia of Human Geography*, 2009
- Narayan, R., Tidström, A., 2020. Tokenizing coopetition in a blockchain for a transition to circular economy. *J. Clean. Prod.* 263. doi:10.1016/j.jclepro.2020.121437.
- Näyhä, A., 2020. Finnish forest-based companies in transition to the circular bioeconomy - drivers, organizational resources and innovations. *For. Policy Econ* 110, 101936. doi:10.1016/j.forpol.2019.05.022.
- Nielsen, C., Lund, M., Eds.; BookBoon.com/Ventus Publishing Aps: Copenhagen, Denmark, 2014; Volume 1, pp. 22–28.
- Nielsen, C.; Lund, M. A brief history of the business model concept. In *The Basics of Business Models*;
- Niero, M., Hauschild, M.Z., Hoffmeyer, S.B., Olsen, S.I., 2017. Combining EcoEfficiency and eco-effectiveness for continuous loop beverage packaging systems: lessons from the carlsberg circular community. *J. Ind. Ecol.* 21, 742–753. doi:10.1111/jiec.12554.
- Nobre, G.C., Tavares, E., 2020. Assessing the role of big data and the internet of things on the transition to circular economy: part II An extension of the ReSOLVE framework proposal through a literature review. *Johnson Matthey Technol. Rev.* 64, 32–41. doi:10.1595/205651319x15650189172931.
- Okoli C., Schabram K. A guide to conducting a systematic literature review of information systems research. *ssrn Electronic Journal*. 2010
- Ormazabal, M., Prieto-Sandoval, V., Puga-Leal, R., & Jaca, C. (2018). Circular economy in Spanish SMEs: challenges and opportunities. *Journal of cleaner production*, 185, 157-167.
- Ortiz, B.; Donate, M.J.; Guadamillas, F. Inter-organizational social capital as an antecedent of a firm's knowledge identification capability and external knowledge acquisition. *J. Know. Manag.* 2018, 22, 1332–1357.
- Otte-Trojel T., de Bont A., Rundall T. G., van de Klundert J. How outcomes are achieved through patient portals: a realist review. *Journal of American Medical Informatics Association*. 2014;21(4):751–757. [[PMC free article](#)] [[PubMed](#)]
- Paré G., Trudel M.-C., Jaana M., Kitsiou S. Synthesizing information systems knowledge: A typology of literature reviews. *Information & Management*. 2015;52(2):183–199.
- Parida, V., Burström, T., Visnjic, I., & Wincent, J. (2019). Orchestrating industrial ecosystem in circular economy: A two-stage transformation model for large manufacturing companies. *Journal of business research*, 101, 715-725.

- Parida, V., Sjödin, D., & Reim, W. (2019). Reviewing literature on digitalization, business model innovation, and sustainable industry: Past achievements and future promises. *Sustainability*, 11(2), 391.
- Parida, V., Wincent, J., 2019. Why and how to compete through sustainability: a review and outline of trends influencing firm and network-level transformation. *Int. Entrep. Manag. J.* 15, 1–19. doi:10.1007/s11365-019-00558-9.
- Patsopoulos N. A., Analatos A. A., Ioannidis J.P. A. Relative citation impact of various study designs in the health sciences. *Journal of the American Medical Association*. 2005;293(19):2362–2366. [[PubMed](#)]
- Patton, M.Q. *Qualitative Research & Evaluation Methods*, 3rd ed.; SAGE: London, UK, 2002. [[Google Scholar](#)]
- Paul M. M., Greene C. M., Newton-Dame R., Thorpe L. E., Perlman S. E., McVeigh K. H., Gourevitch M.N. The state of population health surveillance using electronic health records: A narrative review. *Population Health Management*. 2015;18(3):209–216. [[PubMed](#)]
- Paul, J., Criado, A.R., 2020. The art of writing literature review: what do we know and what do we need to know. *Int. Bus. Rev.* 29, 101717. doi:10.1016/j.ibusrev
- Paulus-Rohmer, D., Schatton, H., & Bauernhansl, T. (2016). Ecosystems, strategy and business models in the age of digitization-How the manufacturing industry is going to change its logic. *Procedia CIRP*, 57, 8-13.
- Pawson R. *Evidence-based policy: a realist perspective*. London: SAGE Publications; 2006.
- Pawson R., Greenhalgh T., Harvey G., Walshe K. Realist review—a new method of systematic review designed for complex policy interventions. *Journal of Health Services Research & Policy*. 2005;10(Suppl 1):21–34. [[PubMed](#)]
- Pearce, D. W., & Turner, R. K. (1989). *Economics of natural resources and the environment*. Johns Hopkins University Press.
- Pedersen, E.R.G.; Gwozdz, W.; Hvass, K.K. Exploring the relationship between business model innovation, corporate sustainability, and organisational values within the fashion industry. *J. Bus. Ethics* 2018, 149, 267–284.
- Petersen K., Vakkalanka S., Kuzniarz L. Guidelines for conducting systematic mapping studies in software engineering: An update. *Information and Software Technology*. 2015;64:1–18.
- Petticrew M., Roberts H. *Systematic reviews in the social sciences: A practical guide*. Malden, ma: Blackwell Publishing Co; 2006.

- Poppo, L.; Zhou, K.Z.; Zenger, T.R. Examining the conditional limits of relational governance: Specialized assets, performance ambiguity, and long-standing ties. *J. Manag. Stud.* 2008, 45, 1195–1216.
- Porter, G.: *The Rise of Big Business, 1860–1910*. By Glenn Porter. New York, Thomas Y. Crowell Company, 1973. Pp. vi+ 119. \$2.95. *Business History Review*, 47(4), 533-535 (1973).
- Potting, J., Hekkert, M., Worrell, E. & Hanemaaijer, A. *Circular Economy: Measuring Innovation in the Product Chain*. (PBL Netherlands Environmental Assessment Agency, 2017)
- Rajala, R., Hakanen, E., Mattila, J., Seppälä, T., & Westerlund, M. (2018). How do intelligent goods shape closed-loop systems?. *California Management Review*, 60(3), 20-44.
- Ranta, V.; Aarikka-Stenroos, L.; Mäkinen, S.J. Creating Value in the Circular Economy: A Structured Multiple-Case Analysis of Business Models. *J. Clean. Prod.* 2018, 201, 988–1000
- Rashid, A.; Asif, F.M.A.; Krajnik, P.; Nicolescu, C.M. Resource conservative manufacturing: An essential change in business and technology paradigm for sustainable manufacturing. *J. Clean. Prod.* 2013, 57, 166–177.
- *Reconstructing the giant: on the importance of rigour in documenting the literature search process*. Paper presented at the Proceedings of the 17th European Conference on Information Systems (ecis 2009); Verona, Italy. 2009.
- Ritala, P.; Huotari, P.; Bocken, N.; Albareda, L.; Puumalainen, K. Sustainable business model adoption among S&P 500 firms: A longitudinal content analysis study. *J. Clean. Prod.* 2018, 170, 216–226.
- Rodrigue, J. P. (2020). *The geography of transport systems*. Routledge
- Rousseau D. M., Manning J., Denyer D. Evidence in management and organizational science: Assembling the field's full weight of scientific knowledge through syntheses. *The Academy of Management Annals*. 2008;2(1):475–515.
- Rowe F. What literature review is not: diversity, boundaries and recommendations. *European Journal of Information Systems*. 2014;23(3):241–255.
- Sage Publications ed. Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ* 339, 332– 336. doi:10.1136/bmj.b2535.
- Sauv e, S., Bernard, S., & Sloan, P. (2016). Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research. *Environmental development*, 17, 48-56.

- Schaltegger, S.; Lüdeke-Freund, F.; Hansen, E. Business cases for sustainability: The role of business model innovation for corporate sustainability. *Int. J. Innovat. Sustain. Dev.* 2012, 6, 95–119.
- Schumpeter, J. A. *The theory of economic development: An inquiry into profits, capital, credit, interest and the business cycle.* London: Oxford University Press, 1934
- Seitanidi, M.M.; Crane, A. Implementing CSR through partnerships: Understanding the selection, design and institutionalisation of nonprofit-business partnerships. *J. Bus. Ethics* 2009, 85, 413–429.
- Seitanidi, M.M.; Koufopoulos, D.N.; Palmer, P. Partnership formation for change: Indicators for transformative potential in cross sector social partnerships. *J. Bus. Ethics* 2010, 94, 139–161.
- Seles, B. M. R. P., Mascarenhas, J., Lopes de Sousa Jabbour, A. B., & Trevisan, A. H. (2022). Smoothing the circular economy transition: The role of resources and capabilities enablers. *Business Strategy and the Environment*, 31(4), 1814-1837.
- Selsky, J.W.; Parker, B. Cross-sector partnerships to address social issues: Challenges to theory and practice. *J. Manag.* 2005, 31, 849–873
- Sforzi, F. (2005). *Dal distretto industriale allo sviluppo locale. Lezione inaugurale-Artimio: Incontri pratesi sullo sviluppo locale.*
- Sforzi, F. (2008). *Il distretto industriale: da Marshall a Becattini.* *Pensiero economico italiano*: XVI, 2, 2008, 1000-1010.
- Shapiro, C., Varian, H. R., & Carl, S.: *Information rules: A strategic guide to the network economy.* Harvard Business Press (1999). .
- Shea B. J., Hamel C., Wells G. A., Bouter L. M., Kristjansson E., Grimshaw J. et al. Boers M. amstar is a reliable and valid measurement tool to assess the methodological quality of systematic reviews. *Journal of Clinical Epidemiology.* 2009;62(10):1013–1020. [[PubMed](#)]
- Shepperd S., Lewin S., Straus S., Clarke M., Eccles M. P., Fitzpatrick R. et al. Sheikh A. Can we systematically review studies that evaluate complex interventions? *PLoS Medicine.* 2009;6(8):e1000086. [[PMC free article](#)] [[PubMed](#)]
- Shirky, C.: *Here comes everybody: The power of organizing without organizations.* Penguin (2008).
- Shumate, M.; Hsieh, Y.P.; O'Connor, A. A nonprofit perspective on business–nonprofit partnerships: Extending the symbiotic sustainability model. *Bus. Soc.* 2018, 57, 1337–1373.
- Shumate, M.; O'Connor, A. The symbiotic sustainability model: Conceptualizing NGO-corporate alliance communication. *J. Commun.* 2010, 60, 577–609

- Silva B. M., Rodrigues J. J., de la Torre Díez I., López-Coronado M., Saleem K. Mobile-health: A review of current state in 2015. *Journal of Biomedical Informatics*. 2015;56:265–272. [[PubMed](#)]
- Skarzynski, P., & Gibson, R. *Innovation to the core*. Boston, MA: Harvard Business School Press, 2008
- Skelcher, C.; Sullivan, H. *Working across Boundaries—Collaboration in Public Services*; Palgrave Macmillan: Basingstoke, UK, 2002.
- Smith V., Devane D., Begley C., Clarke M. Methodology in conducting a systematic review of systematic reviews of healthcare interventions. *bmc Medical Research Methodology*. 2011;11(1):15. [[PMC free article](#)] [[PubMed](#)]
- Smith, N. (2002). Uneven development and location theory: towards a synthesis. In *New Models in Geography-Vol 1* (pp. 170-193). Routledge.
- Somaya, D., & Teece, D.: Patents, licensing, and entrepreneurship: Effectuating innovation in multi-invention contexts. *Entrepreneurship, innovation, and the growth mechanism of the free-enterprise economies*, 185-212 (2007).
- Sousa-Zomer, T.T.; Miguel, P.A.C. Sustainable business models as an innovation strategy in the water sector: An empirical investigation of a sustainable product-service system. *J. Clean. Prod.* 2018, 171, 119–129.
- Stahel, W. R. (1982). *The product life factor. An inquiry into the nature of sustainable societies: The role of the private sector* (Series: 1982 Mitchell Prize Papers), NARC, 74-96.
- Stahel, W. R. (1998). *From Products to Services: Selling performance instead of goods*. IPTS Report, 27(1998), 35-42.
- Stern, P. C. (2000). New environmental theories: toward a coherent theory of environmentally significant behavior. *Journal of social issues*, 56(3), 407-424.
- Stewart, R. & Niero, M. Circular economy in corporate sustainability strategies: A review of corporate sustainability reports in the fast-moving consumer goods sector. *Business Strategy and the Environment* 27, 1005– 1022 (2018)
- Stewart, R., & Niero, M. (2018). Circular economy in corporate sustainability strategies: A review of corporate sustainability reports in the fast-moving consumer goods sector. *Business Strategy and the Environment*, 27(7), 1005-1022.
- Stubbs, W.; Cocklin, C. Conceptualizing a sustainability business model. *Org. Environ.* 2008, 21, 103–127
- Sun, J. J., Bellezza, S., & Paharia, N. (2021). Buy less, buy luxury: Understanding and overcoming product durability neglect for sustainable consumption. *Journal of Marketing*, 85(3), 28-43.

- Sylvester A., Tate M., Johnstone D. Beyond synthesis: re-presenting heterogeneous research literature. *Behaviour & Information Technology*. 2013;32(12):1199–1215.
- Tate, W. L., Bals, L., Bals, C., & Foerstl, K. (2019). Seeing the forest and not the trees: Learning from nature's circular economy. *Resources, Conservation and Recycling*, 149, 115-129.
- Teece, D. Business models and dynamic capabilities. *Long Range Plan.* 2018, 51, 40–49
- Teece, D. J., Pisano, G., & Shuen, A.: Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), 509-533 (1997).
- Teece, D. J.: Dynamic capabilities and strategic management: Organizing for innovation and growth. Oxford University Press on Demand (2009).
- Templier M., Paré G. A framework for guiding and evaluating literature reviews. *Communications of the Association for Information Systems*. 2015;37(6):112–137.
- Thomas J., Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. *bmc Medical Research Methodology*. 2008;8(1):45. [[PMC free article](#)] [[PubMed](#)]
- Trevisan, A. H., Castro, C. G., Gomes, L. A. V., & Mascarenhas, J. (2022). Unlocking the circular ecosystem concept: Evolution, current research, and future directions. *Sustainable Production and Consumption*, 29, 286-298.
- Tukker, A. (2015). Product services for a resource-efficient and circular economy—a review. *Journal of cleaner production*, 97, 76-91.
- Upward, A.; Jones, P.H. An ontology for strongly sustainable business models: Defining an enterprise framework compatible with natural and social science. *Org. Environ.* 2016, 29, 97–123.
- Velenturf, A. P., & Purnell, P. (2021). Principles for a sustainable circular economy. *Sustainable production and consumption*, 27, 1437-1457.
- Veleva, V., & Bodkin, G. (2018). Corporate-entrepreneur collaborations to advance a circular economy. *Journal of Cleaner Production*, 188, 20-37.
- Veleva, V.; Bodkin, G. Corporate-Entrepreneur Collaborations to Advance a Circular Economy. *J. Clean. Prod.* 2018, 188, 20–37
- Vernon, R. (1992). International investment and international trade in the product cycle. In *International economic policies and their theoretical foundations* (pp. 415-435). Academic Press.
- Vezzoli, C.; Ceschin, F.; Diehl, J.C.; Kohtala, C. New design challenges to widely implement 'sustainable product-service systems'. *J. Clean. Prod.* 2015, 97, 1–12.
- Walsh, C. (2022). Stakeholder Capitalism: An Investigation of the Linkage between Corporate Social Responsibility and Financial Performance.

- Weber, A. (1929). Theory of the location of industries (C. J. Friedrich, Trans.). University of Chicago Press. (Original work published 1909).
- Webster J., Watson R.T. Analyzing the past to prepare for the future: Writing a literature review. *Management Information Systems Quarterly*. 2002;26(2):11.
- West, J.; Bogers, M. Open innovation: Current status and research opportunities. *Innovation* 2017, 19, 43–50.
- Whitlock E. P., Lin J. S., Chou R., Shekelle P., Robinson K.A. Using existing systematic reviews in complex systematic reviews. *Annals of Internal Medicine*. 2008;148(10):776–782.
- Wijkman, A. & Skanberg, K. The Circular Economy and Benefits for Society: Jobs and Climate Clear Winners in an Economy Based on Renewable Energy and Resource Efficiency. (Club of Rome, 2016)
- Williamson, O. E.: Organizational innovation: The transaction cost approach. University of Pennsylvania, Center for the Study of Organizational Innovation(1980).
- Wishart, D. S., Feunang, Y. D., Guo, A. C., Lo, E. J., Marcu, A., Grant, J. R., ... & Wilson, M. (2018). DrugBank 5.0: a major update to the DrugBank database for 2018. *Nucleic acids research*, 46(D1), D1074-D1082.
- Yariv Taran and Harry Boer, A Business Model Innovation Typology, Decision Sciences Institute, 2015
- Zaheer, A.; Venkatraman, N. Relational governance as an interorganizational strategy: An empirical test of the role of trust in economic exchange. *Strateg. Manag. J.* 1995, 16, 373–392.
- Zott, C.; Amit, R. Business model design and the performance of entrepreneurial firms. *Organ. Sci.* 2007, 18, 181–199.
- Zott, C.; Amit, R. The fit between product market strategy and business model: Implications for firm performance. *Strateg. Manag. J.* 2008, 29, 1–26
- Zott, C.; Amit, R.; Massa, L. The business model: Recent developments and future research. *J. Manag.* 2011, 37, 1019–1042.
- Gutmann, T., Chochoiek, C., & Chesbrough, H. (2023). Extending open innovation: Orchestrating knowledge flows from corporate venture capital investments. *California Management Review*, 65(2), 45-70.
- Kanda, W., Geissdoerfer, M., & Hjelm, O. (2021). From circular business models to circular business ecosystems. *Business Strategy and the Environment*, 30(6), 2814-2829.
- Neligan, A., Baumgartner, R. J., Geissdoerfer, M., & Schöggel, J. P. (2023). Circular disruption: Digitalisation as a driver of circular economy business models. *Business Strategy and the Environment*, 32(3), 1175-1188.

- <https://accogliamoleidee.wordpress.com/2016/02/20/cifre-e-sviluppo-nel-vicentino/>
- Chang, Y. T., & Hsieh, S. H. (2019, February). A preliminary case study on circular economy in Taiwan's construction. In IOP Conference Series: Earth and Environmental Science (Vol. 225, p. 012069). IOP Publishing.
- (https://www.innoveneto.org/wp-content/uploads/2023/09/brochure-RIR-e-Distretti_agg2022.pdf)
- Shuen, A.: Web 2.0: A Strategy Guide: Business thinking and strategies behind successful Web 2.0 implementations. O'Reilly Media, 2 (2018).
- Kitchenham B., Charters S. *ebse Technical Report Version 2.3*. Keele & Durham. uk: Keele University & University of Durham; 2007. Guidelines for performing systematic literature reviews in software engineering.
- Crane, A. Exploring green alliances. *J. Mark. Manag.* 1998, 14, 559–579