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Orchestration in Mature Entrepreneurial Ecosystems Towards a Circular Economy: A Dynamic Capabilities Approach

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ABSTRACT

The novelty of this article lies in its focus on how mature ecosystems align their members around a new value proposition, specifically supporting circular economy entrepreneurship. We use dynamic capabilities theory to analyse the coordination and collaboration challenges in entrepreneurial ecosystems that seek to support entrepreneurship based on circular economy strategies. Drawing on interviews with 34 ecosystem actors and 70 circular new ventures, as well as three focus group discussions, we identify key challenges that hinder the ecosystem's alignment: (i) a lack of shared understanding of the circular economy concept, (ii) diverse business strategies for circular value creation, (iii) insufficient support tools for circular new ventures and (iv) limited interactions between specialists and generalists. Overcoming these challenges requires ecosystem orchestrators with a holistic perspective, strong legitimacy and the ability to mobilize ecosystem-level resources. These orchestrators must foster a shared vision (sensing), promote investment in circular expertise (seizing) and adapt the ecosystem to the evolving needs of circular new ventures (reconfiguring). Using the circular economy context, we contribute to ecosystem theory by highlighting the importance of materiality, the emergence of geographically unbound entrepreneurial ecosystems and the role of non-market exchanges. For practitioners, this article offers actionable insights for reconfiguring mature entrepreneurial ecosystems for new value propositions such as providing support for circular economy entrepreneurs.

1 | Introduction

Circular entrepreneurial ecosystems comprise a set of interdependent actors and factors that are governed in such a way that they strive to enable entrepreneurship based on circular economy strategies. New ventures, that is, founding teams,

start-ups and young firms usually less than 10 years old (Fichter et al. 2023), can play a crucial role in the transition to a circular economy. Such ventures have the potential to experiment with and develop disruptive circular business models away from incumbents and mainstream markets (Henry et al. 2020) despite their liabilities of newness and smallness (Klofsten et al. 2024).

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However, commercializing disruptive circular business models face significant challenges in gaining mainstream market acceptance. This is because current global production and consumption systems, along with policies, markets, business practices and consumer culture, have been historically developed around linear resource flows. For new ventures, addressing this challenge requires innovative business modelling and resources such as networks, knowledge and funding (Suchek, Ferreira, and Fernandes 2022). Hence, collaboration with actors across different sectors and strategic partnerships are essential to access vital resources and capabilities to close linear resource flows (Awan, Sroufe, and Shahbaz 2021; Kanda, Geissdoerfer, and Hjelm 2021). Circular entrepreneurial ecosystems consisting of institutional arrangements and actors endowed with resource seek to provide different kinds of support for the development and scaling of circular new ventures (Aarikka-Stenroos, Ritala, and Thomas 2021).

Entrepreneurship is increasingly expected to address grand sustainability challenges. Thus, mature entrepreneurial ecosystems are challenged to adapt their support for circular economy entrepreneurship, yet significant challenges persist. First, because of the circular economy's emerging nature, key actors such as incubators, science parks and venture development centres often lack specialized expertise in supporting circular entrepreneurship (Kanda et al. 2024). Second, circular economy expertise within these ecosystems is fragmented, siloed and not well-suited for new ventures, leading to inadequate support (Kanda et al. 2024). Moreover, circular economy specialists (e.g., universities and research centres) and generalists (e.g., incubators and new venture centres) within ecosystems often lack purposeful interaction, revealing a strategic coordination challenge in entrepreneurial ecosystems.

To address these challenges, orchestration—a deliberate and purposeful set of actions by ecosystem leaders to encourage collaborative value cocreation and coordination—is crucial for entrepreneurs to thrive within circular entrepreneurial ecosystems. Orchestration facilitates ecosystem governance through three externally oriented dynamic capabilities: vision formation (sensing), persuading participants to invest in the ecosystem (seizing) and solving unexpected challenges (reconfiguring) (Foss, Schmidt, and Teece 2023). Although recent academic contributions on orchestration in ecosystems are conceptual, further empirical analysis is needed to highlight orchestration dynamics beyond the firm-level, which is often characterized by joint commercial value creation (Santos et al. 2023). Finally, knowledge about how ecosystem leaders can orchestrate mature ecosystems to align around new value propositions such as providing support for circular economy entrepreneurship is limited. Extant empirical research on ecosystems has mainly focused on emergent (or 'nascent') ecosystems, offering limited insight into how mature ecosystems align their members around a new value position (Paavola, Gawer, and Hänninen 2025) such as providing support for circular economy entrepreneurship.

Addressing this research gap is relevant for ecosystem stakeholders such as policymakers and funders seeking to facilitate the continuous adaptation of entrepreneurial ecosystems to new value propositions. Essentially, coordination and collaboration

challenges are not likely to end once an ecosystem is established but continuously emerge as ecosystems evolve because of technological developments (e.g., artificial intelligence), external competition, internal competitive dynamics and unforeseen landscape disruptions (e.g., pandemics and wars), making orchestration a continuous ecosystem process. As explained in the longitudinal study by Etzkowitz and Klofsten (2005, 254), the 'endless transition' in ecosystems involves continuously redeveloping the ecosystem, identifying new areas of growth linked to emerging themes and questioning existing activities. Furthermore, scholars have recently called for more empirical work on orchestration in mature ecosystems around new value propositions (Lingens, Seeholzer, and Gassmann 2023). Thus, the aim of this article is to analyse orchestration in mature entrepreneurial ecosystems adapting to provide support for circular economy entrepreneurship. To do so, we address the following research questions:

- What are the coordination and collaboration challenges faced by entrepreneurial ecosystems when adapting to support circular economy entrepreneurship?
- How can the coordination and collaboration challenges of adapting entrepreneurial ecosystems to support circular economy entrepreneurship be addressed through orchestration?

We address these coordination and collaboration challenges between ecosystem actors such as incubators, science parks, business development organizations and intermediaries, when a mature entrepreneurial ecosystem strives to align around a new value proposition of providing support for circular economy entrepreneurship. The circular economy context is particularly relevant to explore these questions because the transition to circular economy cuts across several sectors and requires the combination of different domains of knowledge (e.g., product design, institutional conditions and business model innovation) making coordination and collaboration between different ecosystem actors essential. Extending from Foss, Schmidt, and Teece (2023), we conceptualize ecosystem orchestration as a governance approach based on dynamic capabilities theory (Teece 2007) to address coordination and collaboration challenges in mature entrepreneurial ecosystems that need to adapt to provide support for circular economy entrepreneurship.

The rest of the paper is structured as follows: In Section 2, we review previous literature relevant for our research aim and questions. This is followed by our research method in Section 3. Section 4 presents the empirical findings. We analyse and discuss our empirical findings in Section 5 and conclude on our research aim and questions in Section 6.

2 | Research Background

Three concepts underline this study: (i) circular economy: this is the conceptual context we have researched, and we focused on ecosystem support targeted at ventures that strive for a circular economy as defined in Section 2.1; (ii) entrepreneurial ecosystems: as our empirical context, we are investigating the orchestration of entrepreneurial ecosystems for a circular economy, as

outlined in Section 2.2, as our main unit of analysis; and (iii) dynamic capabilities: this is the main strategy theory we engage to analyse orchestration, and an overview is provided in Section 2.4.

2.1 | Circular Economy

Considerable academic effort has been made to define the circular economy concept, with Kirchherr et al. identifying 114 definitions in 2017 and 221 in 2023 (Kirchherr et al. 2023). The upside of this definitional interest is that there is a lot of academic engagement with the CE concept. As a descriptive definition for the circular economy concept, we adopted the definition by Geissdoerfer et al. (2020, 2) as ‘an economic system in which resource input and waste, emission, and energy leakages are minimised by cycling, extending, intensifying, and dematerialising material and energy loops. This can be achieved through digitalisation, servitisation, sharing solutions, long-lasting product design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling.’

The idea of using a broader approach to analyse the business models beyond the individual firm predates the *circular* business model concept (Amit and Zott 2001). Essentially, the value creation, delivery and capture in circular business models extend beyond the focal firm to encompass an extended network of suppliers, partners and customers (Kanda, Geissdoerfer, and Hjelm 2021). To grasp the intricacies of these complex networks of value creation activities is paramount to understanding, planning and successfully implementing many circular business models (Geissdoerfer et al. 2020). Analysing the circular economy on the organizational level has initially been approached from a single-firm or business unit standpoint following most conventional business model conceptualisations. However, this firm-centric view is limited in capturing the essence of many business models in a circular economy, which often operate within substantial value networks spanning diverse stakeholders, often across multiple markets and sectors (Geissdoerfer et al. 2020; Kanda, Geissdoerfer, and Hjelm 2021). Consequently, some emerging conceptualizations of the circular business model, for example, Kanda, Geissdoerfer, and Hjelm (2021) and Konietzko, Bocken, and Hultink (2020), incorporate an ecosystem view encompassing aspects such as value networks, customer interface and governance beyond the firm’s core strategy and resources.

There are adjacent fields, especially industrial ecology that offers valuable ecosystem-oriented perspectives that can be transferred to the analysis of circular ecosystems. Industrial ecology involves a network of companies collaborating to exchange material and energy resources to generate economic, social and environmental value. However, although the field focuses on the evolution and impacts of industrial ecosystems over time focusing on energy and material flows, it does not often combine this with the entrepreneurial perspective needed to analyse circular business models. To address this limitation, we borrow insights from entrepreneurial ecosystem literature that focuses on actors and factors that enable productive entrepreneurship within a particular territory.

2.2 | Entrepreneurial Ecosystems

It has long been observed that economic activity varies across geographic space. The intellectual tradition dating back centuries was to attribute variance in spatial performance to difference in the endowment of resources and factors of production. Although Ricardo emphasized natural resources, and Malthus prioritized labour, Marx and later Solow (1956, 1957) focused on physical capital. The focus on explaining the spatial economic performance subsequently shifted to skilled labour and human capital (Coleman 1988; Becker 2009), followed most recently by knowledge (Romer 1986, 1990).

Porter (1998) revolutionized thinking and policy about geographic economic performance by shifting the focus from factors of production to their spatial structure and organization. According to Porter, a spatial structure and organization of economic activity consisting of complementarities in both a vertical and horizontal sense, or what he termed a cluster, would generate enhanced output and productivity for any given endowment of resources and factors of production. He extended the earlier work of Becattini (2004) emphasizing a spatial structure consisting of an industrial district, where economic performance was driven not just by factors of production and resources but also by complementarities in economic activity.

Policy corresponded to the academic thinking about what drives spatial economic performance. The prevalent regional policy priority for ‘smokestack chasing’, or inward foreign direct investment, reflected the primacy of the factor of physical capital in shaping economic performance (Audretsch 2015). Policies focusing on attracting companies engaging in research and development (R&D), talent, highly educated workers and the creative class corresponded to a shifting priority of the factors of human capital and knowledge. By contrast, policies to develop clusters and smart specialization focused on the spatial structure and organization of those key factors of production and resources.

As a compelling theory, case studies and systematic empirical evidence linked spatial economic performance to entrepreneurship, the focus again shifted to enhancing entrepreneurship (Audretsch, Keilbach, and Lehmann 2006). The early research had focused solely on the entrepreneur and their firm, ignoring the external context. However, more recently, studies have shown that entrepreneur and their firms draw on external resources and factors of production to enhance their own performance, which in turn drives the performance of cities, regions, provinces and entire nations. Those external factors and resources, spanning the entire range of inputs enhancing entrepreneurial performance, have been characterized as constituting an entrepreneurial ecosystem (Stam and Van de Ven 2021). The main distinction between the more traditional concept of the cluster and its predecessor, the industrial district and the entrepreneurial ecosystem, is that, although all highlight economies generated by complementarities among the various actors, organizations and institutions constituting the spatial structure and organization, the former two focus on extant and legacy organizations, whereas the latter has the entrepreneur and their organization as the driving force fuelling spatial economic performance.

Knowledge emerged as a key factor for spatial economic performance and concomitantly for the entrepreneurial ecosystem (Stam and Van de Ven 2021). The knowledge spillover theory of entrepreneurship posits that entrepreneurship provides an important conduit for the transmission of knowledge from the organization where it was originally created to the new entrepreneurial organization where it becomes commercialized through innovation (Audretsch 1995). Thus, the knowledge spillover theory of entrepreneurship not only explains why organizations investing in and creating knowledge can be an important component of an entrepreneurial ecosystem but also the mechanism facilitating how and why the entrepreneur and her firm can access and absorb that external knowledge. The concomitant policy priority shifting the focus to developing, nurturing and sustaining an entrepreneurial ecosystem reflects the key role played by entrepreneurship as a driving force enhancing spatial economic performance (Audretsch 2015).

What has received less attention in the scholarly literature as well as by thought leaders in policy and business is the heterogeneity inherent in both entrepreneurship as well as the corresponding ecosystem. There are many manifestations of entrepreneurship, ranging from disruptive, highly innovative, scale-up, to incrementally innovative, sustainable and circular. An effective ecosystem is congruent not just with what the entrepreneurs need to generate high performance but also with what the stakeholders and constituents of the ecosystem prioritize in terms of the performance outcomes of that entrepreneurial ecosystem. Thus, entrepreneurial ecosystems are as inherently heterogeneous as their stakeholders and constituents, as well as entrepreneurship itself. The dual challenge confronting entrepreneurial ecosystems is to provide and preserve the congruence between the (needs of) the entrepreneurs and the constituent organizations, firms and actors, on the one hand, and the values and priorities of the constituent stakeholders and constituents, on the other hand. The ability for the entrepreneurial ecosystem to continually scan and balance the needs of the entrepreneurs, with the efficacy of the corresponding ecosystem components and the values and priorities of the underlying stakeholders and constituents' shapes both the performance and the sustainability of the evolving entrepreneurial ecosystem.

2.3 | Circular Entrepreneurial Ecosystems

The concept of ecosystems is widely used in the fields of strategy, entrepreneurship and management. Jacobides, Cennamo, and Gawer (2018) identified three different conceptualizations of ecosystems in their review. First, business ecosystems focus on the firm and its context, whereas platform ecosystems consider how actors organize around a platform. Finally, innovation ecosystems focus on the joint effort by independent actors to deliver a value proposition based on an innovation. The ecosystem concept emphasizes the interdependence among various entities and provides a framework for examining value cocreation. Beyond these, exchanges of material and energy resources are core to industrial and urban ecosystems, whereas knowledge exchange is central in entrepreneurial ecosystems (Aarikka-Stenroos, Ritala, and Thomas 2021).

Circular entrepreneurial ecosystems stem from the foundational concept of entrepreneurial ecosystems and circular economy (Kanda 2023). Entrepreneurial ecosystems emphasize entrepreneurship as a process in which opportunities for creating new goods and services are explored, evaluated and exploited. The term ecosystem is often attributed to Tansley (1935), in the field of ecology, who argued that in a fundamental sense, organisms cannot be separated from their external environment and there is a constant interchange between organisms and their physical environment. Altogether, the heart of the entrepreneurial ecosystem concept is its emphasis on a systems approach, that is, complexity, interdependency and coevolutionary nature that allows for a comprehensive analysis of entrepreneurship by considering the activities of several actors and their interrelations with a variety of contextual factors (Stam and Van de Ven 2021).

The transition to a circular economy relies on collaboration between stakeholders. Circular entrepreneurial ecosystems, made up of interconnected actors like accelerators, incubators, universities and intermediaries, support the exploration of opportunities through circular principles—slowing, narrowing, regenerating and closing resource flows (Ferreira, Klofsten, and Urbano 2025). These ecosystems foster circular business model experimentation and venturing, with the goal of creating and capturing circular value. A well-developed supportive environment is crucial for the survival of circular new ventures (*ibid*). A well-aligned circular entrepreneurial ecosystem is necessary for new ventures to capture the benefits of circular economy such as aligning businesses with sustainability goals, reducing costs through waste minimization and driving innovation. It helps manage risks, improves reputation, attracts top talent and fosters sustainable growth, ensuring firms remain competitive and forward-thinking in a changing market (Aryee and Kanda 2024). Based on this background, circular entrepreneurial ecosystem can be conceptualized as a network of interconnected actors and factors, including individuals, organizations and institutions, that collectively strive to support and foster entrepreneurship based on circular economy principles (c.f. Kanda 2023). In this article, we define circular entrepreneurial ecosystems based on the well-established definitions of entrepreneurial ecosystems by Stam (2015) and circular economy by Geissdoerfer et al. (2020). Circular entrepreneurial ecosystems comprise a set of interdependent actors and factors that are governed in such a way that they strive to enable entrepreneurship based on circular economy strategies, such as cycling, extending, intensifying, dematerializing and regenerating material and energy flows.

Although entrepreneurial ecosystem actors include science parks, incubators, business development organizations, intermediaries and orchestrators, the ecosystem factors include (i) institutional arrangements (e.g., circular economy policies, consumer awareness and engagement in circular practices, circular networks and hubs) that legitimate, regulate and incentivize circular new ventures; (ii) resource endowments to foster basic scientific knowledge on circular economy, financing and pool of competent labour for CE; (iii) market shaping activities by new ventures, incumbents and customers in an economy dominated by linear economic transactions; and (iv) outputs in terms of circular products and services. As shown in Figure 1, circular entrepreneurial ecosystems are (i) not necessarily restricted to

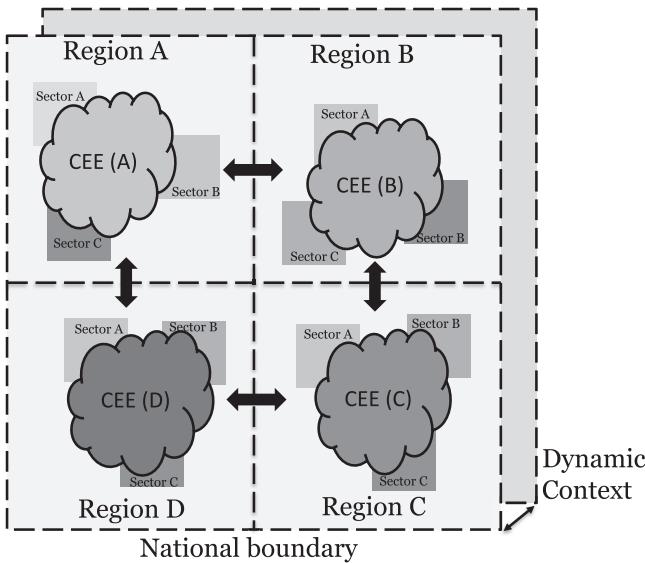


FIGURE 1 | Circular entrepreneurial ecosystem (CEE) (Source: authors).

a regional scope due to the need to combine different domains of knowledge in the circular economy, (ii) highly dependent on collaboration between diverse actors from different sectors and geographies and (iii) organizations such as universities can take central roles in such ecosystems as the motors knowledge creation. Our conceptualization, as depicted in Figure 1, draws on our decades of research on the circular economy, entrepreneurial ecosystems and innovation systems to highlight how to think about the system boundaries, sectors and interactions within circular entrepreneurial ecosystems (Hekkert et al. 2007; Kanda et al. 2018, 2020). Finally, the plurality of visions, diversity of actors, competition for resource and relevance highlight the need for coordination and collaboration in the reconfiguration of entrepreneurial ecosystems to support circular entrepreneurship.

2.4 | Orchestration as a Dynamic Capability

Entrepreneurial ecosystems face coordination and collaboration challenges since they are complex evolving systems responding to multiple stimuli from their target clients (entrepreneurs) and stakeholders. Essentially, there are several actors and activities in such ecosystems that can lead to misaligned interests and objectives, power struggles and conflicts. Addressing these challenges in an ecosystem is often beyond market transactions and demands strategic governance (Foss, Schmidt, and Teece 2023). Previous research analyse orchestration as a dynamic capability that includes a deliberate set of evolving actions by focal organization(s) to initiate and manage ecosystem value creation (Linde et al. 2021). Thus, to analyse orchestration in entrepreneurial ecosystems, we utilize Teece's (2007) tripartite dynamic capabilities model, highlighting three externally oriented dynamic capabilities: (i) fostering a shared vision (sensing), (ii) encouraging ecosystem-specific investments (seizing) and (iii) engaging in problem-solving to establish and maintain stability (reconfiguring). Reconfiguration remains a crucial capability even in mature ecosystems when adapting to value proposition such as providing support for circular economy entrepreneurship. Ecosystem orchestrators need certain leadership skills and

activities similar to dynamic capabilities of firms but at a more aggregate level (Linde et al. 2021).

Several contributions highlight the significance of ecosystem orchestration (e.g., Foss, Schmidt, and Teece 2023; Santos et al. 2023). Beyond developing conceptual frameworks for analysing the structure and functions of ecosystem orchestrators, prior studies have utilized case studies to identify various orchestrator types, their activities and their impact on overarching ecosystem goals. Given our focus on the role of orchestration in addressing coordination and collaboration challenges during the adaptation of entrepreneurial ecosystems for the circular economy, we conceptualize orchestration as a dynamic capability, following Teece (2007). Although dynamic capabilities within firms typically focus on internal adaptation to changing environments, in ecosystems, these capabilities take on an outward orientation, encompassing strategic activities that facilitate coordination and collaboration among diverse actors (Foss, Schmidt, and Teece 2023).

Dynamic capabilities theory helps analyse both the microfoundations of challenges in entrepreneurial ecosystems for circular venturing and the orchestration needed to address these challenges. Orchestration as a dynamic capability involves 'sensing' by codeveloping a shared vision, 'seizing' by fostering investment in this vision and reconfiguring to manage unforeseen issues. The orchestration structure (single or shared), bottom-up or top down, varies with ecosystem maturity, reflecting the dynamic capabilities required (Santos et al. 2023). Adapting ecosystems for the circular economy involves uncertainty about its long-term relevance and requires developing new framework conditions, with a key challenge being whether actors deem this specialization strategically viable.

3 | Research Method

The overall methodological approach of this study is qualitative with extensive data collection through semistructured interviews and focus group discussion. This approach is chosen based on the explorative nature of the research question and the novel character of the studied phenomena (i.e., orchestration in entrepreneurial ecosystems towards circular economy). Thus, we have used an inductive approach (c.f. Azungah 2018) to empirically identify coordination and collaboration challenges in entrepreneurial ecosystems and then used dynamic capabilities theory to analyse how those challenges can be overcome.

3.1 | Data Collection

During the initial phase of data collection, we conducted semistructured interviews with new ventures developing circular business models such as transforming waste feathers into packaging insulation, renting modular workwear and repurposing electric vehicle batteries at their end of life. These interviews yielded insights into their operations, motivations, work approaches, their challenges and support they wanted from entrepreneurial ecosystems. Between 2021 and 2024, a total of 70 new ventures were interviewed. We have continued to interview and follow up on some of these new ventures to capture their early

growth dynamics up to date. Each interview, conducted by multiple interviewers, was recorded, transcribed and complemented with data from new venture web pages, reports and marketing material. Data from this initial phase are not explicitly reported in this article but were key to understanding certain coordination and collaboration challenges in entrepreneurial ecosystems since their core target group for whom they create value are new ventures. Findings from this initial study are published in Kanda et al. (2024).

During the second phase of data collection, we conducted semistructured interviews with Swedish entrepreneurial ecosystem actors, including business coaches, science park representatives and incubator directors. Our focus was particularly on ecosystem actors who had regular interactions with new ventures. A total of 34 such interviews were conducted in 2022, recorded and transcribed (see Table 1). Interviewees were selected not only from ecosystem actors involved in new venture development but also from those engaged in circular economy knowledge development, including universities and competence centres. Drawing on insights from the first phase and relevant ecosystem literature, the semistructured interviews explored ecosystem actors' understanding of the circular economy, their competencies, tools for supporting circular business models, collaboration (or lack of collaboration) with other ecosystem actors and challenges in supporting new ventures effectively.

Further primary data were also collected through focus group discussions with representatives from new ventures and ecosystem actors, enabling observation of interactions and identification of shared understandings and divergences. Prospective participants were selected from previously interviewed new ventures and ecosystem actors. The first focus group in 2021 focused on the challenges new ventures faced in developing and commercializing circular business models, whereas the second focus group discussion in 2022, primarily consisting of ecosystem actors, discussed their competencies and improvements needed to better support circular new ventures. A follow-up focus group in 2024 brought together circular new ventures and ecosystem actors to address the gap between them. Three circular new ventures presented their challenges, followed by five ecosystem actors discussing their competencies and approaches to the circular economy, leading to discussions on fostering effective support for circular new ventures (Table 4).

The research team facilitated focus group discussion, guided by specific questions, which were recorded and transcribed. The first focus group, comprising 12 discussants and facilitated by three researchers, focused on new ventures developing circular business models, covering (i) the concept of circular new ventures, (ii) the main challenges faced and (iii) strategies to overcome these challenges (see Table 2). The second focus group targeted the entrepreneurial ecosystem, discussing (i) ecosystem actors' current competencies in the circular economy, including tools, methods, approaches and networks, and (ii) ways to develop the ecosystem to support the emergence and scaling of circular new ventures, with 12 participants facilitated by two researchers (see Table 3). The third focus group, also with 12 participants, examined (i) how new ventures interested in the

circular economy can better find support, (ii) how new ventures and ecosystem actors can develop a common understanding of the circular economy and (iii) how ecosystem actors can integrate circular economy principles into their support processes (Table 4). Figure 2 provides a simplified overview of the research method, illustrating how interviews and focus groups complemented each other and validated our empirical data.

3.2 | Data Analysis

Our overarching approach to analyse the empirical data followed four qualitative data analysis steps as described by Vaismoradi, Turunen, and Bondas (2013). These steps included (i) immersion in and distancing from the empirical data, (ii) identifying themes from the empirical data, (iii) relating themes to established knowledge and (iv) developing a storyline. First, we carefully reviewed the interview transcripts, identifying and highlighting significant, recurring themes and key issues relevant to our research questions. In the second step, we condensed the extensive raw data into manageable sections pertinent to analysing coordination and collaboration challenges among ecosystem actors. In the third step, we used the themes identified to develop a storyline on coordination and collaboration challenges in entrepreneurial ecosystems. Finally, we used dynamic capabilities theory to analyse how to overcome the coordination and collaboration challenges we identified in the ecosystem. For a detailed description of the initial three steps, see Kanda, Geissdoerfer, and Hjelm (2021) who used a similar approach in their study of circular business ecosystems.

During the thematic analysis phase, we employed an open coding approach to identify emerging themes related to coordination and collaboration challenges in ecosystems, avoiding preconceived notions (c.f. Gioia, Corley, and Hamilton 2013). Given the limited prior research on coordination and collaboration challenges entrepreneurial ecosystems towards a circular economy, this method was especially suitable. A thorough examination of the transcribed empirical data allowed us to comprehend respondents' perspectives (Vaismoradi, Turunen, and Bondas 2013). Subsequently, we distilled the extensive raw data into relevant themes (first-order concepts, second-order themes and aggregate dimensions), aiding in a concise presentation of our findings (see Figure 3). To delve deeper into how to overcome the coordination and collaboration challenges, we applied Teece's (2007) dynamic capabilities framework, focusing on fostering a collective vision (sensing), motivating tailored investments (seizing) and participating in emergent problem resolution for stability (reconfiguring) to analyse the empirical challenges identified.

4 | Results

In this section, we offer empirical insights into the Swedish entrepreneurial ecosystem concerning coordinating and collaboration challenges. Sweden is chosen for its active support for circular economy, its high EU start-up rankings and our extensive contacts in the ecosystem, crucial for data collection. We present our findings in two parts: an overview of the Swedish entrepreneurial ecosystem's structure and the coordination and collaboration challenges for circular economy in the ecosystem.

TABLE 1 | Overview of entrepreneurial ecosystem actors interviewed.

Ecosystem actor	Focus area	Position of interviewee
1. Sahlgrenska Science Park	Science park focused on innovation and acceleration in life science.	Head of business development
2. LEAD incubator	Business incubator focused on technology-based start-ups.	Business coach
3. Almi Företagspartner	Business development organization focused on supporting SMEs to grow and develop.	• Business developer • Business manager
4. High five innovation hub	Innovation hub that supports entrepreneurship and innovation	Student coach
5. Artic business incubator and accelerator	Support entrepreneurs to develop their ideas commercially	Senior business advisor and investment manager
6. Södertälje Science Park	Science park that supports both small and large players in the industrial sectors to promote sustainable production	Start-up responsible
7. Ideon Innovation	Incubator supporting start-ups in their entrepreneurial journey	Incubator manager
8. DigitalWell Ventures	Assists businesses and entrepreneurs in developing the healthcare services of the future and digital solutions for education, healthcare and elder care.	Process Leader Entrepreneurship & Commercialization
9. Skaraborgs Industrial Development Center	The mission is to enhance the competitiveness and profitability of manufacturing companies.	Industrial Developer—Innovation
10. Bergkvara Invest	Specializes in business development with a focus on companies with growth ambitions or in need of change	Founder and CEO
11. Medeon Incubator	Incubator focused on knowledge-intensive companies in the life science sector (pharmaceuticals, medical technology, biotechnology and healthcare).	Incubator manager
12. Borås Ink	Incubator in a science park cluster focused on sustainable business development in the textile and fashion industry.	New business developer
13. Dalarna Science Park	Science park focused on extensive experience in sustainable business development.	Sustainable business developer
14. Peak Innovation Science Park	Stimulate the emergence of new businesses, develop existing companies, with the aim of enhancing regional competitiveness and attractiveness	Business developer
15. Skellefteå Science City	Municipality's development and innovation company with an objective to transform Skellefteå city with innovation and sustainability	Business development manager
16. Founders Loft Incubator	Support entrepreneurs and companies in their business development	Head of coaching and sustainability
17. Innovatum Science Park	Facilitating collaboration between businesses, academia and the community, focusing on the development of sustainable innovations in industrial technology	Innovation leader bioeconomy

(Continues)

TABLE 1 | (Continued)

Ecosystem actor	Focus area	Position of interviewee
18. Region of Scania (Division for Regional Development)	Focused on regional development and renewal	Development and innovation manager
19. Chalmers Ventures	Deep tech investor and venture builder in the Nordics	Head of venture creation
20. Karolinska Institute Innovations AB	Innovation support system and an incubator that provides support and guidance to business development based on research in the health sector	Business coach
21. Vreta Kluster	Vreta Kluster is an innovation and development centre for the agricultural sector.	Business coach
22. Region of Östergötland	Focused on regional growth and renewal	Innovation and industry development strategist
23. Innovation Center for Rural Areas	Support entrepreneurship in rural regions	Operations manager
24. Linköping Science Park	Technology focused science park.	Project manager
25. Region of Östergötland (Division of Energy Efficiency)	Promoting energy and resource efficiency in industries	Team leader
26. Sustainable Business Hub	Cluster organization focused on smart sustainable cities.	Business developer
27. LiU Innovation	Supports the application of research from Linköping University for sustainable development	Innovation advisor
28. LiU Invest	Invests in companies built on research from Linköping University	Investment manager
29. Region of Scania (Division for Regional Development)	Focused on regional development and renewal	Environmental strategist
30. Krinova Incubator and Science Park	Incubator and science park focused on supporting innovation and entrepreneurship in the food sector.	Business developer
31. Region of Östergötland	Focused on regional development and renewal	Process leader
32. Norrköping Science Park	Science park focused on supporting entrepreneurship within visualization, printed and organic electronics and efficient logistics.	Project manager
33. Minc incubator	Incubator for start-ups across different sectors	Sustainable business developer
34. Hållbar Utveckling Skåne	Supports sustainable development in the region of Scania	Project leader

4.1 | Structure of the Swedish Entrepreneurial Ecosystem

The Swedish entrepreneurial ecosystem consists of individuals, organizations and institutions at various levels, such as businesses, academia and policies, which could play crucial roles in enabling entrepreneurship. The Swedish entrepreneurial ecosystem can be described as mature (c.f. Paavola, Gawer, and Hänninen 2025) since the core partners have long been known

to ecosystem participants, relationships have evolved to encompass a repertoire of stable social interaction routines and the core value proposition around entrepreneurship has crystallized into a stable understanding that most participants share. In Sweden, the entrepreneurial ecosystem can be described across two to three administrative levels.

At the national level, several authorities are tasked with promoting business and economic development. Among these

TABLE 2 | Overview of focus group 1 participants.

Actor type	Focus area	Position of discussant
1. Circular new venture	Platform for renting gadgets	Founder and CEO
2. Circular new venture	Repurposing end-of-life electric vehicle batteries	Founder and CEO
3. Circular new venture	Renting modular workwear	Founder and CEO
4. Circular new venture	Reusable food packaging	Founder and CEO
5. Circular new venture	Plastic-free food packaging	Founder and CEO
6. Circular new venture	Customized cosmetics to reduce waste	Founder and CEO
7. Circular new venture	Brewing beer from waste bread	Founder and CEO
8. Ecosystem actor	Regional development county of Kalmar	EU coordinator for bioeconomy and circular economy
9. Ecosystem actor	Incubator for start-ups across different sectors	Sustainable business developer
10. Ecosystem actor	Research on circular economy—design, business model and policy interface	University professor
11. Ecosystem actor	Science park focused on sustainable innovation and entrepreneurship.	Strategic business developer

are Vinnova (Sweden's innovation agency) and The Swedish Agency for Economic and Regional Growth (Tillväxtverket). Through delegation, they provide funding to regional actors and initiatives aimed at fostering entrepreneurial ecosystems in their vicinity. These organizations work to promote sustainable growth and enhance the competitiveness of companies across Sweden. They contribute to the development of Sweden's innovation and entrepreneurship capacity. This is achieved by financing research and innovation projects, as well as coordinating strategic initiatives, collaborating with stakeholders across sectors and highlighting good practices and agendas. A good example is the national incubator program funded by Vinnova, which provides support to newly established firms. Quality-assured and excellent incubators are given an opportunity to promote development and value creation in new knowledge-intensive companies with significant international potential. Most incubators funded by the program are located at university campuses. The program is designed for long-term sustainability, where incubators can receive ongoing funding, as long as they pass a quality assessment each time continued financing is offered (Germain et al. 2023).

At the regional level, there are several relatively large public organizations with different focus and target audience. Here, we can mention Regional Development Funds and business development organization (Almi), Universities, Municipalities and the County Boards. These organizations fund a variety of support activities to promote entrepreneurship and innovation within the ecosystems. They also collaborate with smaller organizations in the regions, which is an effective way to get closer to firms and entrepreneurs (c.f. Gifford, McKelvey, and Saemundsson 2021; Kanda et al. 2022). For instance, universities often fund and host incubators and other organizations that are specialized towards specific target groups. The key ambition is for all these organizations to collaborate within an ecosystem where they operationally complement each other

and contribute both expertise and financial resources to the ecosystem.

An essential aspect of entrepreneurial ecosystems is their longevity (Frykfors and Klofsten 2011), as improvement initiatives require time to yield results. Both ecosystems and their firms need sufficient time for development, and governmental efforts often take a considerable period before becoming effective. Fostering learning and competence development within the ecosystem is crucial for enhancing responsiveness to societal changes and facilitating collaboration and value creation. Etzkowitz and Klofsten (2005) provide a comprehensive exploration of longevity in their study of the entrepreneurial ecosystem around Linköping University. They formulated a model of knowledge-based regional development, identifying four stages—Inception, Implementation, Consolidation and Renewal—based on longitudinal data and different technological paradigms. Innovation policy emerges from a ‘bottom-up’ approach rooted in ‘collective entrepreneurship’ among business, government and academia. This collaboration leads to a self-sustaining dynamic where industry players take the lead, causing the roles of academia and government to diminish. However, as one technological paradigm becomes exhausted and the need for a new one arises, academia and government must re-establish their roles in fostering the prerequisites for the next wave of innovation, necessitating the ecosystem's development of new capabilities.

4.2 | Coordination and Collaboration Challenges in Entrepreneurial Ecosystems Towards a Circular Economy

The Swedish entrepreneurial ecosystem is historically supportive of productive entrepreneurship with clear roles, direction and vision. It emphasizes continuous learning and improvement. Established initiatives like triple helix programs and

TABLE 3 | Overview of focus group 2 participants.

Actor type	Focus area	Position of discussant
1. Ecosystem actor	Region of Östergötland division focused on regional growth and renewal.	Innovation and industry development strategist
2. Ecosystem actor	Vreta Kluster is an innovation and development centre for the agricultural sector.	Business coach
3. Ecosystem actor	Regional development county of Kalmar	EU coordinator for bioeconomy and circular economy
4. Ecosystem actor	LEAD business incubator focused on technology-based start-ups.	Business coach
5. Ecosystem actor	Almi Företagspartner, a business development organization that focused on supporting SMEs to grow and develop	Business developer
6. Ecosystem actor	Linköping Science Park, a technology that focused on science park	Project manager
7. Ecosystem actor	Ideon Innovation, an incubator supporting start-ups in their entrepreneurial journey	Incubator manager
8. Ecosystem actor	Dalarna Science Park, a science park that focused on extensive experience in sustainable business development	Sustainable business developer
9. Ecosystem actor	High five, an innovation hub that supports entrepreneurship and innovation	Student coach
10. Ecosystem actor	Borås Ink, an incubator in a science park cluster that focused on sustainable business development in the textile and fashion industry	Sustainable business developer
11. Ecosystem actor	Founders Loft Incubator supports entrepreneurs and companies in their business development.	Head of coaching and sustainability
12. Ecosystem actor	Innovatum Science Park facilitates collaboration between businesses, academia and the community, focusing on the development of sustainable innovations in industrial technology.	Innovation leader for bioeconomy

the Swedish incubator program foster engagement and collaborations, leading to growth and entrepreneurship outcomes. However, for the circular economy, certain challenges hinder effective coordination and collaboration between ecosystem actors to effectively support circular new ventures. We describe these empirical challenges thematically below since to the best of our knowledge, there are no established categories of coordination and collaboration challenges in entrepreneurial ecosystems towards CE.

4.2.1 | Complexity of the Concept of Circular Economy

In our study, we identified several challenges related to collaboration within the ecosystem, primarily stemming from the complexity of the circular economy concept. First, as a contested notion, there is a lack of common understanding among ecosystem actors, making it difficult to establish collaborative ground. Additionally, related concepts such as sustainability,

resource efficiency, bioeconomy and industrial symbiosis are more familiar to many actors. For instance, some actors focus on supporting ventures that add value to waste streams rather than intentionally closing linear resource flows, which is central to the circular economy, as highlighted by an innovation and industry development strategist during our interviews (interviews, innovation and industry development strategist). This raises questions about the differences and overlaps between these concepts, their interplay and the appropriate focus for entrepreneurial ecosystem actors, as well as which collaborators to engage with for specific concepts, as discussed by an innovation leader in bioeconomy (c.f. Focus group discussion 2, Innovation leader bioeconomy). Moreover, the broad nature of the circular economy means that actors like incubators, science parks and new venture development centres often feel ill-equipped to develop expertise across all its facets. Supporting new ventures in the circular economy involves various aspects, including product and service design, government policy, business model development, supply chain management and sustainability

TABLE 4 | Overview of focus group 3 participants.

Actor type	Focus area	Position of discussant
1. Circular new venture	Upcycling leather waste into handbags	Founder
2. Circular new venture	Upcycling fruit waste into soft drinks	Founder
3. Circular new venture	Subscription-based clothes use	Co-founder
4. Ecosystem actor	Consultants on sustainable development	Consultant
5. Ecosystem actor	Circular economy knowledge hub	Co-founder
6. Ecosystem actor	Dalarna Science Park	Business developer with sustainability competence
7. Ecosystem actor	LEAD business incubator	Business developer with sustainability competence
8. Ecosystem actor	Regional circular economy hub in region Scania	Project leader
9. Ecosystem actor	University researcher on entrepreneurship and innovation	Professor
10. Ecosystem actor	University researcher on entrepreneurship and circular economy	Associate professor
11. Ecosystem actor	University researcher on industrial symbiosis and circular economy	Associate professor
12. Ecosystem actor	University researcher on entrepreneurship and regional development	Associate professor

assessment, as mentioned by a sustainable business developer (*ibid*). Consequently, even among those actors focused on circular economy knowledge, specialization on different aspects necessitates collaboration to effectively support ventures based on their product type and circular business model, as indicated by a new business developer in the same focus group discussion (c.f. Focus group discussion 2, new business developer).

4.2.2 | Generalist and Specialist Actors in the Ecosystem

Another coordination and collaboration challenge in the ecosystem regarding the circular economy arises from the presence of various actors seeking to support new ventures. This diversity complicates ecosystem navigation for these ventures and results in varying competence levels among the support actors. Although some incubators and science parks have focused on sustainability and the circular economy, investing resources to develop high-level expertise, the dynamics of the circular economy differ across sectors, institutional contexts and types of business models. This necessitates bridging expertise among different ecosystem actors, as noted by a sustainable business developer (c.f. Focus group discussion 2, Sustainable business developer). However, many actors, especially incubators, science parks and new venture development centres, do not aspire to become experts in the circular economy, viewing specialist expertise on circular economy as outside their core mandate.

As one focus group discussant put it ‘as an ecosystem actor, I don’t see the circular economy as becoming my main competence area, but my approach is to identify potential waste resources flows and then get in touch with my network to bring in

expert competence to help close such linear flows’ (Focus group discussion 2, Innovation leader bioeconomy).

Another participant highlighted the challenge of developing comprehensive knowledge on the circular economy because of its broad nature, emphasizing the need for a network of nearby experts who can provide specialist knowledge as needed (c.f. Focus group discussion 2, Sustainable business developer).

Access to specialist knowledge within the ecosystem can be achieved through university researchers, competence centres, incumbent companies and incubators focused on the circular economy, as noted by an incubator manager (c.f. Focus group discussion 2, Incubator manager). Therefore, the proximity of actors’ networks is crucial for obtaining expert knowledge on the circular economy, which can also be extended through digital tools beyond regional and national borders when local expertise is lacking. For ecosystem resource efficiency and effectiveness, collaboration among ecosystem actors beyond regional borders is particularly important in a country like Sweden where dedicated circular economy specialists cannot be located in every region because of a lack of a critical mass of circular new ventures in every region. This approach can be cost-effective and ensures that several cases are directed to circular economy specialist to enhance their interaction with several circular new ventures and hence sharpen their expertise.

As a focus group discussant put it, ‘we cannot develop expert knowledge in all that has to do with the circular economy in new ventures because of the broad nature of the concept. What we need is a contact network of experts in our vicinity who can deliver specialist knowledge when needed’ (Focus group discussion 2, Sustainable business developer).

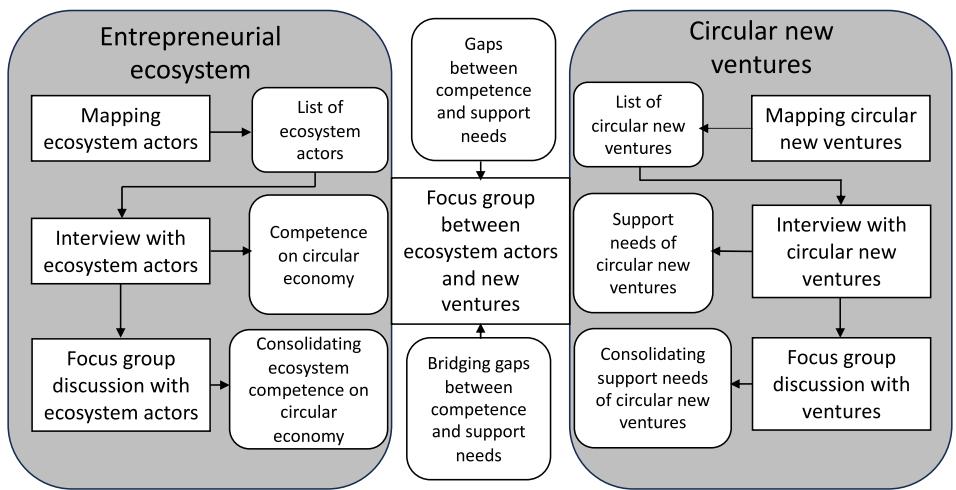


FIGURE 2 | Overview of research method (Source: authors).

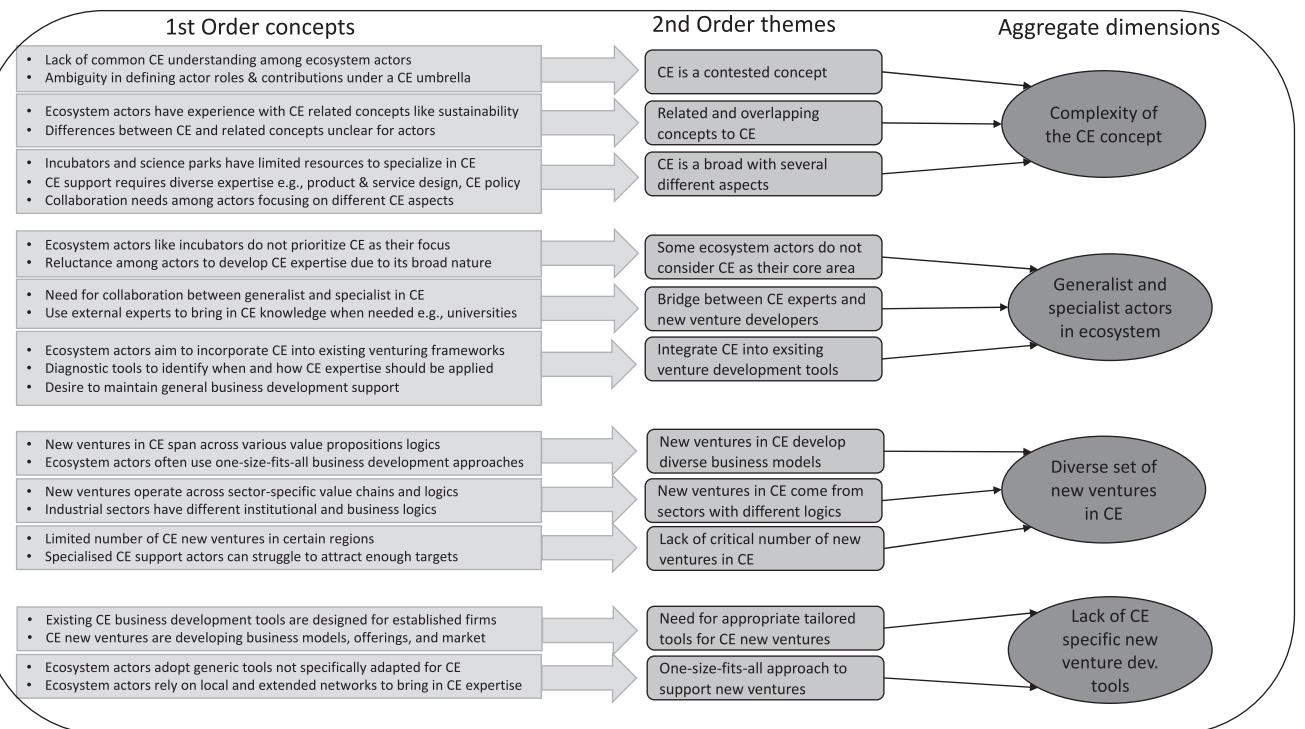


FIGURE 3 | Data structure (source authors, inspired by Gioia, Corley, and Hamilton 2013).

Furthermore, many ecosystem actors have established approaches to support business development in general, such as idea generation, customer acquisition and market development, and seek to integrate circular economy expertise into these processes as necessary. Consequently, having access to diagnostic tools and expertise to incorporate circular economy thinking into their established business support frameworks is considered advantageous, as emphasized by an innovation leader in bioeconomy (c.f. Focus group discussion 2, Innovation leader bioeconomy).

4.2.3 | Diverse Set of New Ventures in the Circular Economy

A notable challenge for collaboration in the ecosystem is the diverse array of targeted new ventures and their associated

circular business models across sectors like construction, plastics, electronics, textiles and agriculture (Kanda et al. 2024). In Sweden's relatively small regional entrepreneurial landscape, achieving a critical mass of new ventures for sector-specific ecosystem actors proves difficult, as highlighted by an incubator manager (c.f. Focus group discussion 2, Incubator manager). Although some sector-focused actors exist, attracting enough target clients, such as incubates, remains a challenge, especially for sustainability-profiled incubators (Bank, Fichter, and Klofsten 2017). As a result, these specialized actors often broaden their selection criteria, leading many ecosystem participants to adopt a one-size-fits-all approach to business development for efficiency in utilizing financial resources and meeting stakeholder demands. Consequently, new ventures developing circular business models frequently receive the same support as other ventures because of a lack of

specialist competence and the desire for monetary efficiency. As noted by a business developer from Almi Företagspartner (c.f. Focus group discussion 2, Almi Företagspartner, Business developer), this approach simplifies initial discussions on circular economy topics, fostering further exploration and engagement with experts. To address this diversity and the lack of critical mass of circular new ventures, many ecosystem actors employ established business development tools, such as the business model canvas, while integrating circularity as needed. As a student coach articulated, the aim is to support all new ventures in reflecting on circularity and raising awareness across their business development processes as a foundation for seeking further expert knowledge. Several incubators also facilitate group coaching for new ventures, enabling mutual support and learning in terms of circularity, as observed by a business coach (c.f. Focus group discussion 2, Student coach).

4.2.4 | Lack of Specific Support Tools and Approaches for Circular New Ventures

A prominent coordination and collaboration challenge identified is the lack of specific tools and approaches to support circular new ventures. Existing business development tools primarily cater to established firms with functioning business models, which shape production and consumption systems. In contrast, circular new ventures often start from scratch, lacking a viable business model, customers or markets. Consequently, there is a pressing need for tools specifically tailored to the requirements of such ventures and their characteristics. Although many ecosystem actors recognize this need, they frequently adopt a one-size-fits-all approach for cost efficiency and to meet stakeholder demands (e.g., funders evaluating incubator programs). For instance, some actors utilize the Sustainability Readiness Level (SRL)—a set of diagnostic questions to support sustainability progress—yet this framework remains unadopted for the circular economy, as noted by a sustainable business developer (c.f. Focus group discussion 2, Sustainable business developer).

Ecosystem actors also struggle to assess the sustainability of circular business models because of the novelty of the concept and the unique characteristics of circular ventures, which often lack data, final products and conventional cash flows, making traditional evaluation models insufficient. A prospective assessment approach, suggested by an incubator manager and the head of coaching and sustainability (c.f. Focus group discussion 2, Incubator manager; Head of coaching and sustainability), could foster collaboration and guide early-stage development. Moreover, employing targeted diagnostic questions could help ecosystem actors integrate external expertise where in-house capabilities are lacking. Given the broad nature of the circular economy, a diverse toolbox is essential. A curated question bank with thoughtful queries could significantly aid the development of various circular products and services across different sectors, as highlighted by a student coach (c.f. focus group discussion, student coach). A crucial question for ecosystem actors, therefore, is when to develop circular economy expertise in-house and when to rely on their networks.

5 | Discussion

In this section, we use dynamic capability theory to discuss strategies to overcome the identified coordination and collaboration challenges in entrepreneurial ecosystems towards circular economy. Circular entrepreneurial ecosystems seek to foster the emergence and development of circular business models through entrepreneurship (Tabas et al. 2025). Circular business models are often intended to disrupt dominant linear and unsustainable business models. Thus, the commercialization and scaling of circular business models by new ventures are constrained by their liabilities of newness and smallness and resistance from incumbent actors together with the markets, user preferences, technology and culture associated with established linear business models (Kanda et al. 2024). Thus, entrepreneurial ecosystems are increasingly being challenged to support new ventures developing circular business models using tailored approaches. However, the complexity of the circular economy concept, limited interactions between generalists and specialists, diversity among new ventures and their strategies in the circular economy and the lack of adapted support tools for new ventures in the circular economy lead to coordination and collaboration challenges in the ecosystem.

Coordination problems in entrepreneurial ecosystem relate to which actors should do what, when and why. Collaboration problems on the other hand encompass how to motivate independent ecosystem actors to engage in joint activities. Coordination and collaboration challenges in ecosystems share several similarities with coordination and cooperation problems described in the literature on economic organization that focuses on alternative governance structures in addressing such challenges (Teece 1984). However, since circular entrepreneurial ecosystems are not only dominated by market transactions and formal contracts as in supplier and buyer relations (e.g., in supply chains) where actors can be replaced relatively easily, managing the ecosystem governance structure through orchestration can be an effective way to address the challenges of coordination and collaboration (Santos et al. 2023). Furthermore, in ecosystems, actors rely to a higher degree on each other's contribution than in traditional value chains (Adner 2017; Awan et al. 2022). Thus, ecosystem management by one or several actors is required. In the literature, such ecosystem-managing actors are conceptualized as orchestrators, keystone actors or systemic intermediaries (Kanda et al. 2020; Santos et al. 2023).

A core question for managing entrepreneurial ecosystems is how to adapt and reconfigure to effectively align around a new value proposition, for example, supporting circular new ventures in a world characterized by rapid technological change and sustainability challenges. Borrowing insights from Foss, Schmidt, and Teece (2023), we argue that certain ecosystem actor(s) must lead and persuade others to make voluntary investments that are consistent with the ecosystem's overarching goals—ecosystem orchestration (c.f. Autio 2022). Without such leadership, an ecosystem would lack competitive advantage, stagnate, become irrelevant and eventually obsolete to the changing needs of new ventures. Even in ecosystem alignments driven by bottom-up initiatives and improvisation, we reckon, there is a need for some form of sense making and leadership (Audretsch, Belitski, and Herzig 2025). Orchestrators operate on a systemic level, beyond their own boundaries,

promoting an explicit vision and taking the lead in aiming for change on the whole system level. They thus require legitimacy, system-level resources and trust to orchestrate the entrepreneurial ecosystem towards circular economy. Potential actors in the Swedish entrepreneurial ecosystem that can take on such roles include Vinnova (Sweden's innovation agency) and SISP (Organization for Swedish Incubators and Science Parks). Vinnova influences the ecosystem through the control and distribution of financial resources and by providing tools for sustainable business development. Vinnova is also responsible for the quality control of the Swedish incubator program. SISP on the other hand influences the ecosystem by being a branch organization that serves as an arena for interaction and resource mobilization among Swedish incubators and science parks. However, Vinnova can be considered more strategic, whereas SISP is more operational and closer to the ecosystem actors relevant for new venturing.

Theory frames orchestration as leadership in ecosystems based on dynamic capabilities targeted at adaptation and reconfiguration to solve coordination and collaboration challenges (Foss, Schmidt, and Teece 2023). Analytically, we adopt Teece's (2007) dynamic capability scheme of sensing, seizing and reconfiguration as an organizing scheme to analyse how to address the ecosystem challenges identified in our empirical findings through orchestration. Specifically, we argue that leadership on an ecosystem level differs from firm level orchestration (which is often internally oriented) and is externally oriented activities of ecosystem orchestrators and highlight activities needed to resolve identified challenges. Figure 4 summarizes orchestration in circular entrepreneurial ecosystems by linking observed challenges with dynamic capabilities needed to address them discussed in further detail below. Nonetheless, our empirical context also presents a case of an ecosystem in search of alignment around a new value proposition of supporting circular entrepreneurship and the activities required for such a process are relevant in the renewal of matured ecosystems in general.

5.1 | Sensing in Entrepreneurial Ecosystems Towards Circular Economy

Sensing involves adopting a system-level perspective to craft a shared vision to overcome directionality uncertainty. This dynamic capability requires strategic vision, persuasive communication and investments to encourage ecosystem actors to embrace this vision. Shared vision serves to coordinate participants to align their resources and competencies. Developing a shared vision and common understanding on the concept of circular economy also provides a direction to learning and exploration, attracting attention and legitimizing support processes for the commercialization and scaling of circular business models. However, the contested nature of the circular economy concept makes establishing a shared vision and thus understanding on the concept challenging. The concept remains not fully understood and is yet to be integrated into new venture development processes. In fact, different actors within the ecosystem may not only hold varying views on the circular economy but may even perceive it as abstract, unfamiliar or overlapping with other concepts such as sustainability and industrial symbiosis. Achieving a shared vision on the circular economy requires orchestration to help ecosystem actors develop a common and coherent understanding of circular economy in the context of new venture development and in particular its end goal of resource effectiveness and efficiency. For example, recent development of ISO 59004:2024 on circular economy provides vocabulary, principles and guidance for the implementation of the circular economy, which is particularly relevant to bringing different independent actors together for a joint effort. Potential orchestrators need to adopt a comprehensive, system-level perspective that involves identifying the relevant set of current and potential ecosystem actors, their capabilities and interdependencies to work with this vision. Furthermore, developing such a system-level vision on circular economy is an iterative process in which the vision moves from the individual orchestrator level to become shared over time and thus requires buy-in from ecosystem actors to secure their engagement.

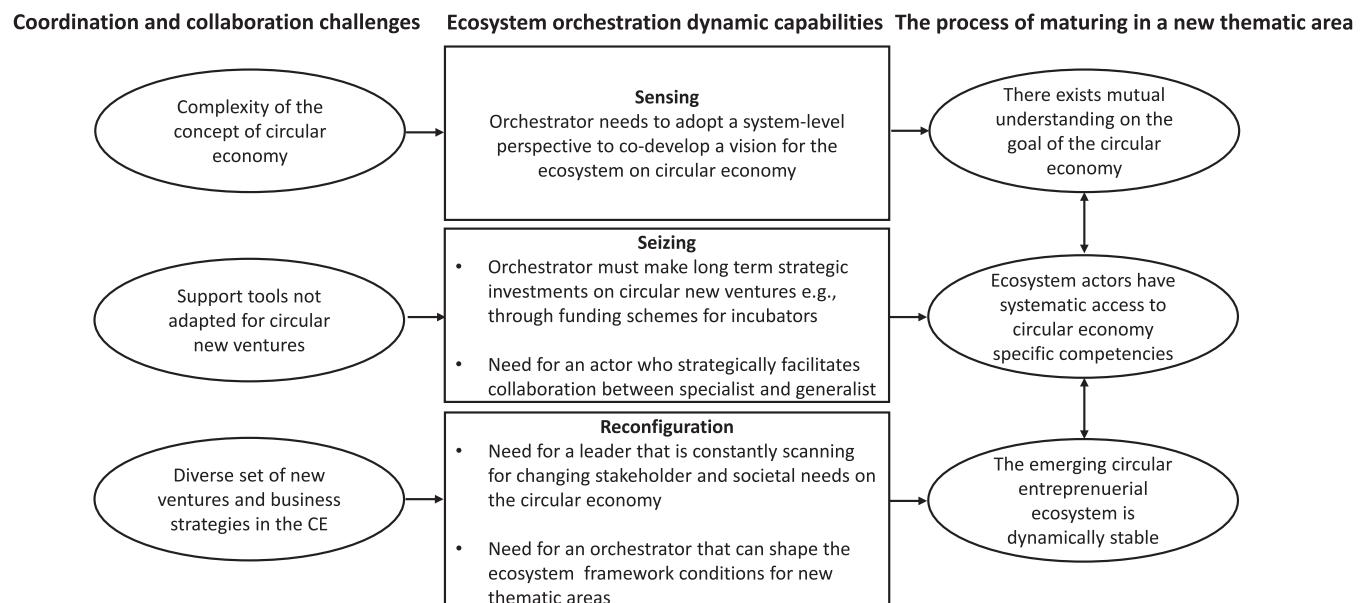


FIGURE 4 | Orchestration in circular entrepreneurial ecosystems.

In practise, early signs of progress in creating a common vision and understanding on the concept are evident. For instance, Dalarna Science Park, with funding from Vinnova, is undertaking a project to further develop SRL with a specific focus on sustainability in general and its integration into business development. The project aims to create educational programs and establish networks to address the growing need for both circularity and sustainability in general among actors in the Swedish entrepreneurial ecosystem. Notably, Vinnova brings extensive experience to this domain, having focused on sustainability and circular economy through innovation system development, research funding and funding for the Swedish incubator program. SISP serves as a vital arena for ecosystem actors to interact and exchange experiences around such topics as well. To effectively establish a shared vision embraced by ecosystem actors, orchestrators need to communicate the circular economy vision persuasively, encouraging targeted knowledge investments in this strategic area and show evidence of their own long-term commitments to the concept. Typically, ecosystem orchestrators would undertake such system-level activities, positioning themselves as outsiders to specific ecosystem actors, creating collaborative spaces and striving for a neutral, unbiased role despite their interest in promoting the transition towards a circular economy.

5.2 | Seizing in Entrepreneurial Ecosystems Towards Circular Economy

Seizing entails persuading other ecosystem actors to make ecosystem-specific investments and adhere to framework conditions such as formal and informal institutions that govern the ecosystem dynamics. For the Swedish entrepreneurial ecosystem to effectively address coordination and collaboration challenges in the context of a circular economy, it is not only about developing a shared vision over time; it requires ecosystem actors to commit to this shared vision by developing specific expertise on circular economy. Ecosystem orchestrators may use different strategies to collaboratively shape the ecosystem's framework conditions such as formal institutions, culture, physical infrastructure and market demand for the circular economy (Thomas, Faccin, and Asheim 2021). Orchestrators need to make strategic and long-term commitments and abide by the mutually agreed-upon rules to secure the commitment of ecosystem actors. SISP plays an active role in establishing arenas for diverse actors to convene, discuss, identify synergies and foster collaboration through formal and informal settings such as meetings, seminars and workshops, promoting coordination and collaboration, particularly from the bottom-up.

However, even with a shared vision, there is no guarantee of commitment from ecosystem participants. Uncertainties can linger regarding the long-term relevance of the circular economy concept and whether circular ventures will continue to be a relevant group and achieve critical numbers in the regional entrepreneurial ecosystems. These long-term uncertainties are vital questions to be addressed when seeking circular economy-specific investments. Circular ventures seek to disrupt existing markets by offering resource-efficient and effective solutions, often facing resistance from incumbents. This resistance can hinder the growth and scaling expectations of such ventures and challenge the expectations of ecosystem

actors rooted in traditional entrepreneurial thinking (e.g., expecting high growth and rapid scaling from circular new ventures). The transition from a shared vision to resource allocation and commitment may be delayed because of these scaling-related challenges. Hence, not all ecosystem actors will readily invest in circular economy-specific knowledge or accept codeveloped framework conditions. Many actors, such as incubators, accelerators and science parks, prioritize agility in competence acquisition and financial efficiency, potentially not viewing the circular economy as their primary expertise area. Thus, the circular economy context challenges the dominant logics of ecosystem actors who predominantly focus on high-growth firms by delivering other environmental and social values based on resource efficiency and effectiveness. Capturing and appropriating such environmental and social values can be challenging in ecosystems because of their public good nature.

Thus, ecosystem orchestrators should make long-term investments and demonstrate commitment to the circular economy. Such commitment signals to ecosystem actors that this is a strategically significant area worthy of resource allocation. For example, system-level actors such as Vinnova have funded several circular new ventures and are an important stakeholder for various ecosystem actors (e.g., universities, competence centres, incubators and science parks) through their funding initiatives and strategic programs. Ultimately, the critical number of circular ventures demanding specific expertise will drive ecosystem actors to invest in developing this specific knowledge in tandem with how such ecosystem actors are evaluated by their stakeholders such as clients and funders (c.f. Bank, Fichter, and Klofsten 2017). Thus, a critical question for ecosystem actors would be to analyse under which conditions to develop their own in-house competence on circular economy and when to outsource such competence to experts such as consultants, universities, incumbents or research centres. A balanced approach could be for ecosystem actors to focus on their core mandates, integrating circular economy principles to a viable extent and connecting to experts when necessary. This approach can be resource effective for the ecosystem resources and also expose circular economy experts to a high number of target clients. Ecosystem leaders need to signal commitment and establish trust to engage others. Training and education programs within networks such as SISP can significantly enhance the competence of incubators and science parks regarding the circular economy. However, participation in such networks and their activities are mostly voluntary, and thus, they have limited mandate and legitimacy to demand certain actions from their members. The credibility of orchestrator investments relies on initiative scope, for example, size and longevity, as addressing coordination challenges takes time and indicates the ability of the orchestrator(s) to facilitate systemic change (c.f. Frykfors and Klofsten 2011).

5.3 | Reconfiguration in Entrepreneurial Ecosystems Towards Circular Economy

Reconfiguration is about addressing unforeseen ecosystem challenges that are not addressed by the existing framework

conditions (Foss, Schmidt, and Teece 2023). Thus, reconfiguration is facilitated by developing system-wide knowledge of framework conditions such as formal institutions, culture, physical infrastructure and demand that shape the incentives, capabilities and needs of ecosystem actors. One of the most crucial dynamic capabilities for orchestrators in entrepreneurial ecosystems is the ability to adapt and reconfigure the ecosystem in response to changing societal and target group needs and the evolving ecosystem itself. Failure to adapt and reconfigure the ecosystem can result in the ecosystem inability to meet stakeholder expectations, exit by some ecosystem actors, eventual ecosystem decline and collapse.

Initially, forming a common vision enables ecosystem actors to recognize and understand their interdependencies and encourages them to make specific investments related to circular economy, as they see commitments from orchestrators. However, as the ecosystem matures in circular economy competence, new and unforeseen challenges may arise (e.g., increasing digitalization, the globalization of circular economy competence and natural resource competition). Addressing these challenges is essential to maintain credibility and retain ecosystem actors, stakeholders and resources. New collaboration challenges can emerge, particularly concerning competition for funding resources, target clients and power within the ecosystem. There can also be competition between circular economy and new thematic areas such as artificial intelligence which can attract away resources (e.g., funding and actors) from the circular economy. Thus, reconfiguring the ecosystem in response to new thematic areas requires joint efforts between ecosystem orchestrators and actors not only focused on the present but potential future trajectories. For example, universities and research centres can play a crucial role in ecosystem reconfiguration as motors of knowledge development on new thematic areas.

Ecosystem reconfiguration is a combination of top-down and bottom-up activities. Orchestrators engage in scanning to identify upcoming thematic areas, initiate discussions with resource owners for competence development and integrate such competence into the ecosystem. New societal challenges emerge necessitating continuous ecosystem reconfiguration. To enable continuous reconfiguration of the ecosystem, orchestrators require comprehensive knowledge of the ecosystem actors including their incentives, capabilities and expectations and continuous scanning of new entrepreneurial trends. In practise, ecosystem-level orchestrators need continuous dialogue with local actors closer to new ventures, for example, incubators and clusters to get an overview of the ecosystem competence and to capture the real needs of circular new ventures (Laur, Klofsten, and Bienkowska 2012).

Finally, orchestration is not an isolated and static activity. Orchestration involves an interplay between top-down sensing, seizing and reconfiguration processes and the reinforcing bottom-up initiatives of ecosystem actors and their improvisation. Each dynamic capability builds on and feeds into the other, creating a continuous process of adaptation and evolution that keeps the ecosystem resilient and responsive. Orchestrators must ensure that sensing is not limited to the early stages but remains an ongoing activity, guiding future seizing and reconfiguration efforts to maintain ecosystem cohesion and long-term viability.

5.4 | Theoretical Contribution and Practical Implications

In this article, we analysed coordination and collaboration challenges in entrepreneurial ecosystems and how to overcome them using orchestration based on dynamics capabilities towards circular economy. A circular entrepreneurial ecosystem is a dynamic network of diverse, independent actors interacting through complementary activities to enable entrepreneurship based on circular economy strategies. The entrepreneurial ecosystem aligns around the focal value proposition of productive entrepreneurship (i.e., new venture creation), where ecosystem actors contribute towards meeting the needs of the new ventures and their stakeholders, leveraging shared resources and capabilities with limited hierarchical control. A particularly pronounced characteristic of entrepreneurship in the circular economy is the interdependency and collaboration among diverse autonomous and interdependent actors to create, deliver and capture value based on the narrowing, slowing, closing and regeneration of material and energy resource flows (Geissdoerfer et al. 2020). These characteristics of circular entrepreneurship dictate how entrepreneurial ecosystems should be adapted to provide relevant support to new ventures in the circular economy.

Analysing orchestration in circular entrepreneurial ecosystems has implications for ecosystem theory in general (c.f. Jacobides, Cennamo, and Gawer 2018). First, entrepreneurship based on circular economy is driven by the recirculation of material and energy resource flows through narrowing, closing, slowing and regeneration. Circular business models cannot be developed by isolated firms and require collaboration beyond individual firm boundaries, sectors and geographical scales (Kanda, Geissdoerfer, and Hjelm 2021). Second, recirculating material and energy resource flows are not always undertaken using market-based transactions as in traditional buyer-seller contracts but can also be undertaken in non-market arrangements such as industrial symbiosis driven by proximity and trust lacking centralized, hierarchical control. Finally, the non-market exchange of energy and material resources flows in the circular economy also highlights the importance of geographic proximity and place in circular economy as there can be geographical, economic and legal limits on material and energy resources exchanges and their transportation across borders and sectors. Furthermore, not all material and energy exchanges generate economic value in the current linear economic model and thus environmental and social value creation becomes important aspects of value creation based on non-market mechanisms leading essentially to the need for market shaping activities and the appropriation of such social and environmental values in ecosystems.

On the other hand, knowledge exchange in circular entrepreneurial ecosystems is not geographically bounded to regions as conceptualized in conventional entrepreneurial ecosystems literature. This is because the circular economy is an economy-wide concept that cuts across several sectors and requires different domains of knowledge beyond regional boundaries (Audretsch et al. 2024). Thus, ecosystem actors increasingly use digital tools to access expertise knowledge both beyond their regions and even internationally, something new to the entrepreneurial ecosystem literature which has traditionally been bound to territories such

as regions. Thus, by studying orchestration in entrepreneurial ecosystem towards circular economy, we extend ecosystems theory by highlighting the importance of materiality, that is, moving beyond the orchestration of knowledge exchange to orchestration to facilitate effective and efficient energy and material flows, geographically unbound ecosystems (crossing regional and national boundaries) and non-market-based exchanges around environmental and social values. This contribution complements ecosystem characteristics such as their modularity, complementarity, non-hierarchical interactions, interdependencies and the deliberate attempt by ecosystem actors to develop system-level goals (Baldwin et al. 2024). Thus, orchestration towards circular entrepreneurial ecosystems is driven by sensing, seizing and reconfiguration based on geographically unbound knowledge exchanges around energy and material resources using both market and non-market exchanges between actors.

From a practical perspective, the study offers important and actionable insights for businesses, policymakers and ecosystem stakeholders seeking to promote collaboration and coordination in the circular economy. It provides valuable guidance on how ecosystem actors can collaborate effectively around a new value proposition. These collaborations go beyond regional boundaries, challenging entrepreneurial ecosystems conceptualization. This approach drives ecosystem renewal and innovation by encouraging ecosystem actors to rethink their activities for supporting circular entrepreneurship. Thinking beyond geographical boundaries allows ecosystems to tap into a broader pool of resources, expertise and technology, improving their competitiveness and capacity to provide relevant support.

6 | Conclusions and Future Research

Effectively addressing coordination and collaboration challenges within entrepreneurial ecosystems is crucial for alignment in mature entrepreneurial ecosystems around a new value proposition of supporting circular entrepreneurship. Within the studied entrepreneurial ecosystem, several challenges have been identified, underscoring the need for concerted efforts to overcome these hurdles. A significant obstacle is the lack of a shared understanding of the circular economy concept within the investigated ecosystem, posing challenges for effective collaboration. Another challenge is motivating ecosystem actors to allocate resources to enhance their circular economy competencies. Some of the investigated actors preferred relying on external networks for expertise rather than investing in in-house competence.

To overcome these challenges, orchestrators are needed to codevelop a shared vision and facilitate essential investments in developing circular economy expertise. Encouraging the ecosystem participants to internalize circular economy knowledge and skills could significantly contribute to overall ecosystem success, with ecosystem orchestrators playing a crucial role in incentivizing and facilitating these internal knowledge investments.

These observations highlight the need for reconfiguring framework conditions to accommodate new competence areas,

particularly circular economy expertise. This includes the development of dynamic capabilities, broadly sensing, seizing and reconfiguration. Investigating the development of circular economy competence in mature entrepreneurial ecosystems through the lens of dynamic capability theory yields valuable insights into how these ecosystems can effectively evolve and adapt to new value propositions.

Our findings also emphasize the importance of ecosystem-level strategies. Integrating circularity metrics, tools for circular economy and innovative business development approaches within entrepreneurial ecosystems can significantly contribute to overcoming challenges such as the complexity of the concept of circular economy, limited interaction between generalist and specialist actors, meeting the diverse needs of different circular new ventures and foster a more efficient and effective support towards circular entrepreneurship. This means that funders of various ecosystem initiatives may need to use relevant institutional pressures (c.f. DiMaggio and Powell 1983) to incorporate sustainability and circularity into their support activities as a condition to access resources such as funding. This aligns with the growing emphasis on business strategies that prioritize environmental sustainability, providing a roadmap for ecosystem actors and policymakers to navigate the complexities of the circular economy realm.

Altogether, the CE context demands an expanded view on the types of exchanges in ecosystems including (i) material and energy resources, (ii) knowledge and (iii) economic value. Unlike orchestration in traditional entrepreneurial ecosystems which focus on the flow of knowledge, circular entrepreneurial ecosystems also encompass material and energy flows. Although the flow of material and energy resources can be geographically restricted, knowledge exchanges have become increasingly geographically unbound because of digitalisation, the economy wide and the sector-cross-cutting nature of the circular economy. The CE context also introduces other key actors into the ecosystem such as governments, NGOs and customers who play more active roles in the development and scaling of circular new ventures placing new demands on orchestrators.

We recommend future research on entrepreneurial ecosystems orchestration towards a circular economy to focus on further investigating the role and effectiveness of ecosystem orchestrators, exploring how they can promote a shared vision, facilitate investments in circular economy expertise and ensure actors' commitment to necessary resources for circular economy entrepreneurship. Additionally, an important contribution to subsequent research could be to focus on the motivations and barriers confronting ecosystem actors in adopting circular economy-specific knowledge, especially considering the possibility of relying on external networks. Such research could provide insights into effective strategies for encouraging internal knowledge investments within entrepreneurial ecosystems to at least ask appropriate questions to circular new ventures. We also recommend investigating the impact of reconfiguring framework conditions to accommodate new value propositions, for example, competence areas, particularly within mature entrepreneurial ecosystems.

Author Contributions

Wisdom Kanda: major role in conception and design, acquisition of data, or analysis and interpretation of data, writing original manuscript and revision. **Magnus Klofsten:** major role in conception and design, acquisition of data, or analysis and interpretation of data, writing original manuscript and revision. **Dzamila Bienkowska:** major role in conception and design, acquisition of data, or analysis and interpretation of data, writing original manuscript and revision. **David B. Audretsch:** major role in conception and design, analysis and interpretation of data, writing original manuscript and revision. **Martin Geissdoerfer:** major role in conception and design, analysis and interpretation of data, writing original manuscript and revision.

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Conflicts of Interest

The authors declare no conflicts of interest.

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