

## RESEARCH ARTICLE OPEN ACCESS

# How Cooperatives Embed Circularity in Their Business Models and Governance—Results From an International Survey

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## ABSTRACT

Cooperatives as a democratic form of economic organization are an emerging focus in research on the social dimensions of circular economy. However, there is no international database on cooperatives and circular economy, impeding systematic analysis. Drawing on the first international database and survey of cooperatives and circular economy from 12 countries in Europe and the Americas, we explore how cooperatives embed circularity in their business models and governance, including the technology and partnership choices this involves, and how this uptake is currently facilitated. The analysis shows there to be a trend of new, usually small cooperatives that pursue circularity as a core value from inception, that tend to prefer upstream circularity strategies and that look for support from established cooperative networks. Already established, also larger cooperatives tend to explore circularity strategies both internally and by forming networks. There is potential for sectoral and intersectoral federations to facilitate circularity uptake.

## 1 | Introduction

With the maturing of circular economy as a research and policy field for systemic transformation towards sustainability (Geissdoerfer et al. 2017), the “social side” of circular economy is receiving increasing attention (Hobson and Lynch 2016; Moreau et al. 2017; Mies and Gold 2021; Corvellec et al. 2022; Ziegler, Bauwens, et al. 2023). Because technological innovation for green economies often prevails in research and policy discussions (Calisto Friant et al. 2020), this stream of research highlights that transitions to just and sustainable circular economies need to pay more attention to inequality with respect to access to circular products and services (Capgemini 2021), the gendered dimension of domestic and communal recycling labour

(Glucksmann 2016), the quality of work in a circular economy (Bakhiyi et al. 2018; Héry and Malenfer 2020), and participation in decisions on adoption of circularity strategies and distribution of benefits (Ziegler et al. 2021). This participatory point highlights a more general question about organizing and cooperating for circular economy activities, as well as sustainability more generally (Ferrerias et al. 2020).

A focus in this emerging research stream is the cooperative. Cooperatives are not only a democratic form of economic organization; their values and principles *prima facie* also align well with circular economy (Vézina 2016; Novkovic 2022). For example, the mutualization of resources at the heart of many cooperative ventures directly speaks to the sharing economy

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as a circularity strategy (Ziegler, Poirieret al. 2023), and the territorial and network embeddedness of cooperatives plays a positive influencing role for the adoption of circularity (De Bernardi et al. 2024). However, to date, the interface of cooperatives and circular economy is insufficiently understood, particularly in relation to the facilitation of circular economy by already existing sectoral and intersectoral coop federations across the world. There is no international database on cooperatives and their adoption of circularity strategies. This impedes a systematic analysis of the role and potential of this organizational type, even though it can be found in all world regions with an estimated 3 million cooperatives worldwide, providing work for about 10% of the employed population, and membership to 12% of the global population (EURICSE 2018; UN 2024). As part of an international partnership effort, we contribute towards closing this data gap by presenting the results of an analysis of the first international database of cooperatives and circular economy from 12 developed and developing countries from Europe and the Americas, and a survey sent to the 754 cooperatives in the database. Drawing on this material, we ask: *How do cooperatives embed circularity in their business models and governance, including the technology and partnership choices this involves? How is the circular economy uptake by cooperatives facilitated given their distinct values and organizational embedding?*

We find that there is a trend of new, usually small cooperatives that pursue circularity as a core value from inception, that tend to prefer upstream circularity strategies and identify a cooperative advantage in the pursuit of circularity. Such cooperatives look for support to establish themselves as a cooperative (finance, legal advice) from established cooperative networks. Then there are the already established, also larger cooperatives, who often share values of the circular economy—notably in support of mutualization and the sharing economy. They tend to explore circularity strategies both internally and by forming networks to achieve circular economy goals. All cooperatives currently do not receive much dedicated support from established coop networks to insert or advance circularity in their models, suggesting a potential of sectoral and intersectoral federations to facilitate the deployment of circularity.

Following an introduction of main concepts and methods in Sections 2 and 3, we present our findings via four layers of cooperatives embedding circularity in Section 4: (1) the adoption of circular business models, (2) the governance of circular coops, (3) their use of technology, (4) and the embedding of organizations in their environment and regions drawing on prior research on the embedding of circular economy by cooperatives (Ziegler, Bauwens, et al. 2023). Section 5 discusses the results.

## 2 | An Embedding Framework for Analyzing the Relationship Between Cooperatives and the Circular Economy

Our theoretical approach is based on a neo-Polanyian institutional perspective that studies cooperatives as economic actors embedded in society (Laville 2008; Roy and Grant 2020). “Embedding” in the following refers to the rules that enable and regulate markets, including noneconomic public and cultural

institutions (Polanyi 1957). Drawing on Granovetter (1985), embedding also includes the social networks that seek to influence, adapt and evolve the rules that constrain and enable activities; and in relation to cooperatives specifically the organization in terms of second- and third-order federations, alliances and consortia. Beckert (2007, 2010) observed a third category of “embedding” related to cognitive frames, and the way in which actors interpret and make sense of economy and society. This aspect is manifest in the cooperative identity, and its distinct set of values and principles (International Co-operative Alliance [ICA] 2021). “Embedding” provides a comprehensive, theoretical perspective to study the specificities of cooperatives, and how the rules, networks and cognitive frames of cooperatives embed a circular economy (Ziegler, Bauwens, et al. 2023). Sections 4.2–4.4 explore this embedding by restating and empirically exploring the conjectures of this prior work.

Drawing on this theoretical framework, cooperatives are viewed as providing an alternative embedding of markets, and notably for the shortcomings of exchange-based market relations. We therefore adopt, where possible, terminology from the cooperative movement to explore the distinct cooperative embedding of the circular economy. According to the International Co-operative Alliance (ICA) (2021), a cooperative identity has emerged and evolves around core values and principles of democratic organization and economic participation that place members at the heart of an organization. They navigate a duality of economic enterprises embedded by democratic governance, such as equality of voice regardless of capital contribution, joint capital ownership, and surplus distribution based on participation in the cooperative (Vienney 1994).

As the ICA testifies, there are millions of cooperatives around the world. There is, however, no database of cooperatives by sector. Still, the *World Cooperative Monitor* (2023) offers some indication with 34% of co-operative activity by turnover in agriculture and food industries (including fishing), 29% in insurance, 18.7 in wholesale and retail trade, 13% in education, health and social work and only 1.7% in industry and utilities.

Turning to circular economy, and in the absence of an internationally agreed definition (Kirchherr et al. 2023), we decided upon a definition that emerged from a stakeholder process involving cooperatives and further social economy partners. It defines a circular economy as a “production, exchange and consumption system aiming to optimize resource use in every stage in the life cycle of a product or service through a circular approach, reduce the environmental footprint and contribute to the well-being of individuals and communities” (Jagou 2021). This definition specifies that circular economy has a purpose, and that meeting this purpose is a systemic challenge.

Sustainable development is increasingly recognized as a purpose of circular economy, but conceptions remain contested (Kirchherr et al. 2023). Drawing on a more general discussion of weak and strong sustainability (Neumayer 2010), we can speak of “weak circular economy” in relation to approaches that seek to achieve circularity via technology innovation in current market systems; and of “strong circular economy” in relation to approaches that seek to rethink our modes of production and consumption and ways of organizing beyond the economic

growth imperative, and towards integrated approaches across all strategies (Aggeri 2023; Ziegler, Poirier, et al. 2023; Bergmann et al. 2024).

The circular economy can be represented as a “butterfly” (Ellen Mac Arthur Foundation 2013, 25): one “wing” based on “biological nutrients” (such as in timber or agricultural produce, which can be conceptualized as a flow or renewable natural capital); and one “wing” based on the use of “technical nutrients” (such as nonrenewable stocks from mining and extractive activities). A regenerative circular economy thus has to “shift” from technical towards biological nutrients (Ellen Mac Arthur Foundation 2013, 25), because only the latter can be regenerated, whereas efficiency and circularity of nonrenewable stocks can only be improved.

Beyond definition and conceptions, the appeal of circular economy as a way of operationalizing sustainability for organizations is also due to the practical component of strategies. The stakeholder process, which we draw on for our definition, is also accompanied by 12 circularity strategies (Jagou 2021), which we used to operationalize the concept (see Box 1). Following this approach, we refer to the first three strategies as “upstream” as they refer to rethinking consumption and design of products and which represent a “strong” circular economy (Aggeri 2023; Ziegler, Poirier, et al. 2023), and to later strategies as “downstream” because recycling and recovery are located at the respective end of production and consumption processes. In between there are the “midstream” strategies of optimizing use.

We further refined the maturity of the strategies drawing on a report for the French Agency for Ecological Transition (ADEME & ICare 2023), which analyzes the maturity of circular business models in terms of a matrix of (1) the development of the circular economy approach: (a) exploring and learning, and (b) the strategy is integrated into the core operations and mission of the cooperative, and (2) the adoption of circularity strategies: (a) from inception, and (b) integrated later in the life of the cooperative. We drew on this matrix for the further characterization of the participants in our survey.

### 3 | Methodology

As there is no available repository of cooperatives pursuing circular strategies, our first step was to create a database in 2023. We did not have sufficient resources for creating a comprehensive, global database, and we therefore chose a purposeful sampling method (Patton 2002) to identify cooperatives that would then provide the material for quantitative and qualitative analysis. Our strategy is theory based (Palinkas et al. 2015), because we used prior definitions of circular economy, strategies and cooperatives drawing on our embedding approach. For the identification of cooperatives, we followed the typology proposed in the guidelines on cooperative statistics (ILO 2022) to include four types of cooperatives—worker, consumer, producer, and multistakeholder—as search criteria (see also Data S1: technical report, 123). This was to ensure the maximum variation (Patton 2002) within our organizational type so as to be able to identify differences and common patterns across these cooperative types.

**BOX 1** | Circularity Strategies (adapted from Institut de l'Environnement, du Développement durable et de l'économie circulaire, see Jagou 2021).

#### *Upstream strategies of rethinking the economy*

1. Eco-conception: the cooperative designs products and services in such a way that ecological impacts are avoided and reduced.
2. Responsible consumption and procurement: the cooperative purchases resources and other inputs in such a way that its environmental footprint is reduced. This includes phasing out, no longer using some materials entirely (e.g., “Zero waste shops”).
3. Optimizing operations: the cooperative optimizes the use of natural resources to reduce its environmental footprint.

#### *Midstream strategies of optimizing use*

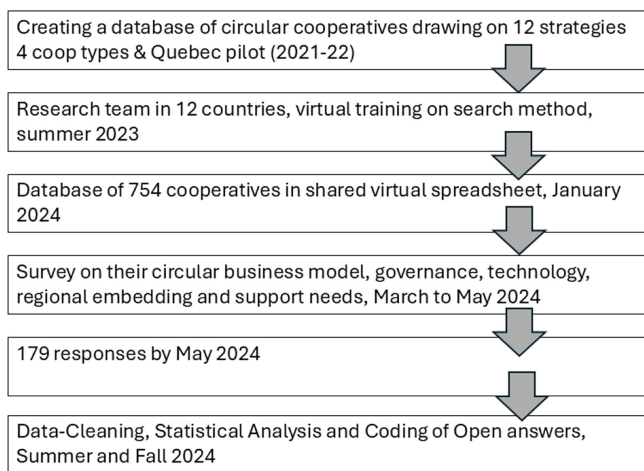
4. Sharing economy: the cooperative participates in the sharing of products and services.
5. Rental: the cooperative rents out products for a fixed period.
6. Servicing and repair: the cooperative offers services of maintenance and repair for goods and products owned by its customers.
7. Giving away and reselling: the cooperative sells used goods and products.
8. Reconditioning/Refurbishing: the cooperative restores products or components to a condition as good as new, with a guaranteed equivalent to or close to that of a new product.
9. Functional/Performance Economy: the cooperative owns products that it rents out to its customers.

#### *Downstream strategies of recycling and valorization of waste*

10. Industrial ecology: the cooperative exchanges materials, by-products, and “waste” with other organizations
11. Recycling and composting: the cooperative organizes recycling and/or composting as a service for its own products or that of another user.
12. Recovery: the cooperative uses residual material (“waste”) to make products and services.

In addition, the circularity strategies allowed us to identify cooperatives that do not use circular economy language but follow one or several of the circularity strategies. In other words, they might not refer to “circular economy” but, for example, have a recycling strategy in place. We refer to this as “implicit” circular economy (Ziegler et al. 2024). Circular economy *avant la lettre* can be expected to play an important role in the cooperative tradition with its emphasis on mutualization and sharing.

On this basis we created an exploratory database and survey as outlined in the next paragraphs (see also Figure 1). Following a pilot test in Canada in 2021–2023, we set up a research team



**FIGURE 1** | Flow chart of approach.

in 12 countries of Europe and the Americas (Belgium, Brazil, Canada, Columbia, Finland, France, Germany, Italy, Mexico, Netherlands, Spain, and the United Kingdom) with one research assistant in each country who worked on the database creation from summer 2023 until January 2024. We organized virtual workshops to familiarize the researchers with definitions and categories and explain search methods. The methods used were (1) desktop research based on the internet and local databases, using circular economy keywords of the 12 circularity strategies linked to our definition of circular economy; (2) consultation of regional and national co-op federations; (3) contacting researchers and already identified cooperatives for further suggestions using the snowball method. Search results were entered into a shared, virtual spreadsheet to collect cooperatives by name, type, sector, mission statement, and circularity strategies. Results were shared for discussion and validation with at least one coop researcher from the respective country as well as the partnership coordinators to validate the database.

This search effort yielded a database of 754 cooperatives, of which 55.8% were located in Europe, and the rest in the Americas. The database includes all types of cooperatives (32% producer cooperatives, 22% worker cooperatives, 16% consumer cooperatives, and 29% multistakeholder cooperatives). It thus offers a cross-country exploratory sample with variations across cooperatives. We stress that this is not an exhaustive database, neither globally nor within the sample countries.

We created an online survey in 2024 to validate and refine the database based on responses by cooperatives in the database. The online survey consisted of six parts. Part one asked for general information about the cooperative (mission, membership, employees, turnover, year of foundation). Parts two to five continued our theory-based approach and explored four categories—business models, governance, technology, and the environment—drawing on our preparatory research (Ziegler, Bauwens, et al. 2023). Circular economy was operationalized using the 12 circularity strategies, each of which was explained in simple terms in the survey. A final part included questions about data-sharing, practical needs of cooperatives in relation to circular economy as well as information about the survey respondent. Results are based on self-reporting and are thus limited by a lack of independent verification, but essentially this

allows us to also analyze and report on how cooperatives understand and implement circular economy.

Following a pre-test and translation into the languages of the 12 countries, the online survey was sent out to the cooperatives in our database in February 2024 and remained open until May 2024. We obtained 179 responses (28% response rate on average per country). In communication with cooperatives, we noted that larger organizations found it harder than small and medium-sized organizations to internally approve survey responses on time, which likely had some effect on the profile of responses we received. We know too that the survey does not reflect the role of cooperative banks, not least as funders of other cooperatives, because for them, the survey was not sufficiently focused on the role of finance. We therefore reviewed results in relation to coop size and indicate below where this yielded observations.

In summer 2024, we cleaned the data. We analyzed responses in summer and fall 2024. Open answers were coded, with two authors independently and inductively coding open answers (Charmaz 2014). Coding aimed to identify key themes emerging across responses. For the coding, we translated all answers to English.

Chi-square tests were conducted using IBM SPSS Statistics software to identify dependent relationships. Due to the high number of possible cross analyses arising from the multitude of questions, the choice of cross analyses performed during the research was based on hypotheses proposed by the research team derived from the domains of cooperatives embedding circularity used for structuring the survey and detailed in sections 4.2 to 4.4. Only complete data from the selected analyses were used for the tests. Results with  $p \leq 0.05$  were selected for graphical representation and are included in the technical report.

In the following we refer to selected questions from the survey adding “Q” plus the number of the question (“Q1”), with all questions and figures in the technical report.

## 4 | Results

### 4.1 | General Profile: Sectors, Age, and Size of Cooperatives

Our database shows cooperatives to be strongly based in the regenerative, renewable “wing” of the circular economy “butterfly”: agriculture and fisheries (24%) are the largest sectors in our database, with further large sectors in food production and distribution (8% for food, and 8% for retail) due to coop producers of biological and organic foods as well as coop shops and supermarkets for distribution (see Data S1: technical report, 121). The shift from fossil fuels to renewable energy sources is also strong in production, for example, renewable energy cooperatives (about 12%) and transportation (8%), with the latter including bike delivery and repair coops. Industrial production, such as automotive and chemical industries is very weakly represented (less than 1% for such industries). The result confirms the strong presence of cooperatives in the “renewables” wing, their relative absence in heavy industries, as well as blindspot in our database

as far as insurers and credit unions are concerned (compare World Coop Monitor above). However, while there are circular coops in the regenerative, renewable “wing” of the economy, they can be expected to depend on noncoop partners for machinery and technical infrastructure from the nonrenewable wing. Also, this dependence does not mean that cooperatives are not present in sectors dealing with nonrenewables. About 5% ( $n = 41$ ) in the sample work in the domain of waste collection, that is, picking of plastic, electronics, and so on, for recycling and transformation.

While the cooperative movement is old, with roots notably in the 19th century response to the industrial revolution and partly drawing on circular economy “implicitly” (e.g., by mutualization of use of tools), cooperatives pursuing circular economy strategies and endorsing circularity as a value appear to be an emerging trend (see Figure 2).

One hundred seventy-nine cooperatives responded to the survey, with a roughly equal share of European cooperatives and those from the Americas, as well as responses across all four cooperative types (Q5), indicating a reasonably good fit between the original sample and the survey response distribution. 63% of these cooperatives report an annual turnover of less than 500,000 Euros, and 25% less than 50,000 annual turnover (Q179). 83% report 50 or fewer employees, and 49% five or fewer employees, making for a sample of small to medium size organizations (Q13). There is no data repository for cooperative size in Europe and the Americas, however, a European Parliament briefing report suggest 27 employees on average for cooperatives in the European Union (Karakas 2019), whereas in the Americas numbers for Canada estimates that over half of cooperatives have no employees, and the large majority are small organizations with some large organization exceptions in banking, insurance and agriculture (Statistics Canada 2023). In short, while there are significant outliers and differences between sectors, the survey responses seem to correspond to cooperatives being mostly small and medium-sized organizations.

## 4.2 | Circularity Strategies and Cooperative Business Models

Because circular economy activities delivered through cooperative models are based on the needs and interests of members, we would expect them to be better protected from the value capture exhibited by capitalist enterprises as well as enabled to cooperate with other actors toward an efficient use of resources (Ziegler, Bauwens, et al. 2023, 6). Here, we will focus on the embedding of circularity strategies by a member-owned organization, whereas the next section will turn to cooperation with further actors.

The circularity strategy most used by cooperatives is the “sharing economy” (see Table 1). The circularity strategy least used is “reconditioning/refurbishing”; all other strategies are present, but upstream strategies are favored. The results support the findings of an earlier study in the province of Québec that found cooperatives to contribute comprehensively to all circularity strategies, yet to favor upstream strategies, notably of sharing and mutualizing of resources, such as for example a shared kitchen or cooling space and shared agricultural machinery being specifically important (Ziegler, Poirier, et al. 2023). Upstream strategies are associated with rethinking the economy, production, and consumption, whereas the downstream categories can only make production and consumption more efficient. The results indicate, within the constraints of an exploratory study, support for the proposition that cooperatives tend to support a strong circularity approach, beyond a techno-modernist focus on efficiency and innovation for green economies.

We also note that only 3% of cooperatives rely on a single circular strategy, whereas 50% are using four to six strategies. Figure 3 shows the relations between circularity strategies (see Data S1: technical report, 118, for an explanation of the method). Each circle represents a circularity strategy as introduced above. The green lines between the circular strategies represent strong relationships, defined as 75% or more of the cooperatives using one circular strategy also use the one to which it is connected.

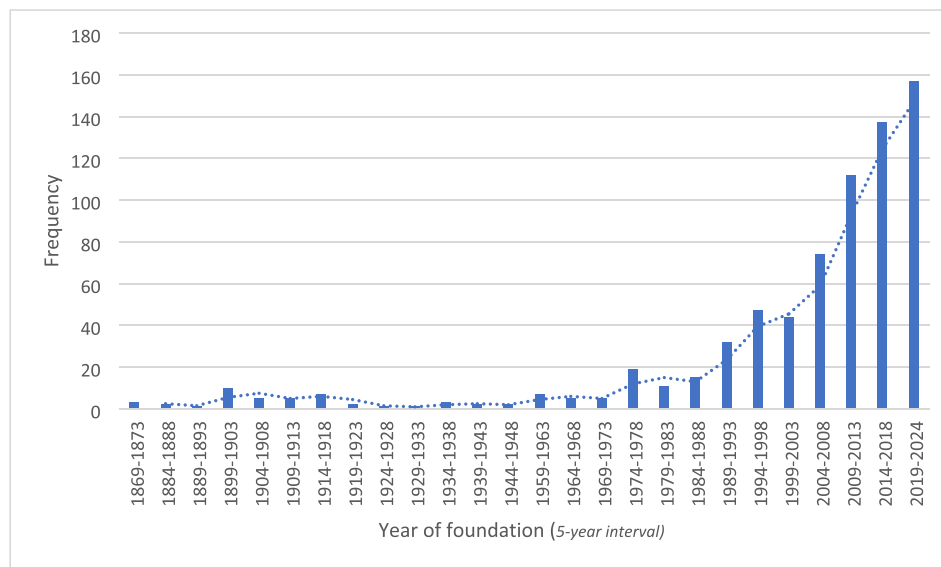


FIGURE 2 | Histogram.

Strategies 2, 3, and 4 are the most interconnected strategies (eight to nine strong connections each), including strong connections between them. The exception is the strategy of eco-conception,

**TABLE 1** | Circularity strategies.

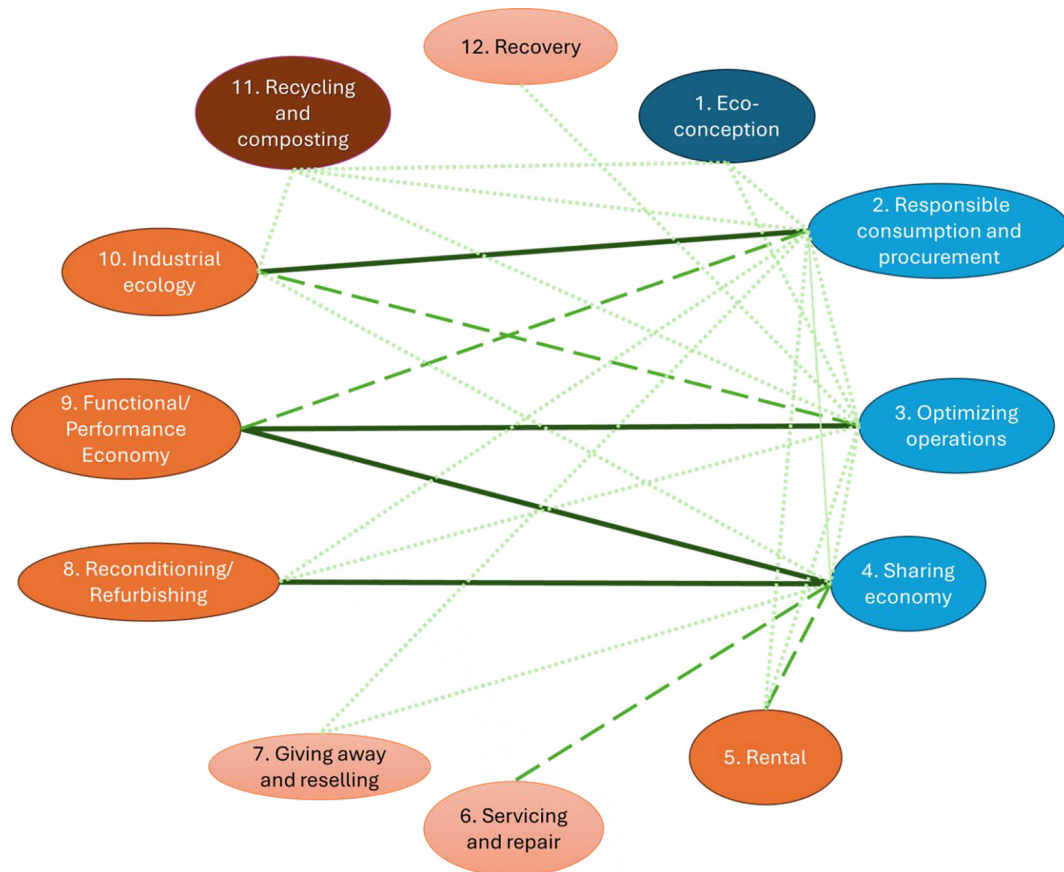
| Circularity strategies                     | N   | %    |
|--------------------------------------------|-----|------|
| 1. Eco-conception                          | 105 | 76%  |
| 2. Responsible consumption and procurement | 106 | 77%  |
| 3. Optimizing operations                   | 106 | 77%  |
| 4. Sharing economy                         | 111 | 80%  |
| 5. Rental                                  | 47  | 34%  |
| 6. Servicing and repair                    | 39  | 28%  |
| 7. Giving away and reselling               | 44  | 32%  |
| 8. Reconditioning/refurbishing             | 31  | 22%  |
| 9. Functional/performance economy          | 36  | 26%  |
| 10. Industrial ecology                     | 47  | 34%  |
| 11. Recycling and composting               | 78  | 57%  |
| 12. Recovery                               | 48  | 35%  |
| Total N                                    | 138 | 100% |

with only three strong ties. The “orange group” consists of Strategies 5, 8, 9, and 10, characterized by strong connections with all the strategies in the light blue group but much less interconnection (only between 10 and 11). The “salmon group” of Strategies 6, 7, and 12 has the least strong connections (one strong connection for 6 and 12, and two for 7). Strategies 11 and 2 are intermediary strategies in terms of strong connections.

The results suggest functional support and complementarity between various circularity strategies, and that it would be a mistake to think of cooperatives pursuing one strategy in isolation. The strong connection of the upstream strategies of responsible consumption and procurement, optimization, and sharing economy suggests an openness to linking the cooperative model of shared ownership to the foundational challenge of rethinking production and consumption, and then linking it to more specific strategies. We also note the exception to this, with the less connected strategy of eco-conception.

There is no significant association between circularity strategies and cooperative type, with the exception of “industrial ecology” as well as “recycling” both being negatively associated with consumer cooperatives.

38% ( $n = 54$ ) of respondents said that their circular economy approach makes a significant contribution to their revenue stream, and a further 26% “somewhat agree.” The Chi-square analysis shows that for cooperatives with a turnover of more than 50



**FIGURE 3** | Circularity strategy connections. *Note:* Strong relationships between circular strategies are represented in three shades of green: light, dotted green for relationships between 75% and 80%, medium, dashed green for those between 80% and 85%, and dark, straight green for relationships above 85%. Blue refers to upstream strategies, and the midstream strategy “sharing economy”.

million Euros, the contribution of the CE to revenue is evenly divided (significant/not significant), and for cooperatives with a smaller turnover the contribution is significant (see Figure 4). Funding for the circularity strategy is reported predominantly to come from members (68%), followed by government (38%) and private investors (26%).

With respect to the maturity of the circularity approach, the ADEME-typology introduced above reveals a majority of cooperatives in our sample to be cooperatives that pursue circularity from inception, and that of those, the majority have fully integrated circularity (see Table 2). By contrast, there are fewer cooperatives who say they adopted circularity during the life of the coop, and very few who assess this to be a fully integrated strategy.

This might be explained in part by the date of creation of the cooperatives, a significant proportion of which have been created since 2004. There are small and medium-sized cooperatives, more recently founded to create a need in relation to circularity and deriving a revenue stream. Older, long-established cooperatives can be larger but were also founded before circularity was a “thing.” As a result, we see the association that the larger a cooperative in terms of the number of employees, the less likely it is to have implemented a circular economy approach from inception (Figure 5). In addition, we note that on the one hand, given the prevailing linear economy, organizational growth might be facilitated by noncircular strategies. In other words, there are likely isomorphic pressures to become more technocentric and extractivist as cooperatives grow. On the other hand, our sample also suggests that some larger cooperatives (such as financial consumer cooperatives and agricultural producer cooperative) sometimes create circular spin-offs, that is, they support the creation of new cooperatives providing circular products and services in relation to their sectors.

In addition, there is a significant relation between full circular economy integration and revenue generation up to a revenue stream of 2 million Euros (see Figure 6). There might be a sweet spot for cooperatives between €500,000 and €2 million for integrating circularity into their core operations. Smaller cooperatives might still be in the development phase and face associated challenges; larger cooperatives might find it more challenging

to integrate circularity into already existing mission and operations. Possibly, there might be an upward shift in the future, if mid-sized cooperatives grow their circular models and larger cooperatives gain the resources and expertise needed to embrace circular economy principles.

### 4.3 | Coop Governance and Circularity

Because circular economy activities delivered through cooperatives are embedded in models of democratic governance, we could expect the latter to promote needs orientation and legitimacy of circular economy among cooperatives (Ziegler, Bauwens, et al. 2023, 7). Accordingly, this section seeks to explore the advantage of cooperative governance for circular economy.

An insufficient understanding of circular economy, and its environmental benefits, might be a barrier to adopting circular practices (CCA 2021, 105). Circular products might be perceived as of minor quality (ibid., 90), and resource extractive sectors might perceive circular economy moreover as a threat to their current business models and current policy support they receive (ibid. 103). That is why we sought to understand the extent to which respondents perceive members and partners of the cooperative to understand the concept of the circular economy. A large majority in our sample (88%,  $n = 123$ ) “strongly agree” (45%) or “somewhat agree” that their members understand the circular economy approach of the cooperative (Q40). They also stated

TABLE 2 | Maturity of business model.

|                                                                            | From inception<br>( $n = 111$ ) | During life<br>of the coop<br>( $n = 26$ ) |
|----------------------------------------------------------------------------|---------------------------------|--------------------------------------------|
| Fully integrated<br>( $n = 77$ )                                           | 72                              | 5                                          |
| Exploring and<br>learning about it,<br>pilot project phase<br>( $n = 60$ ) | 39                              | 21                                         |

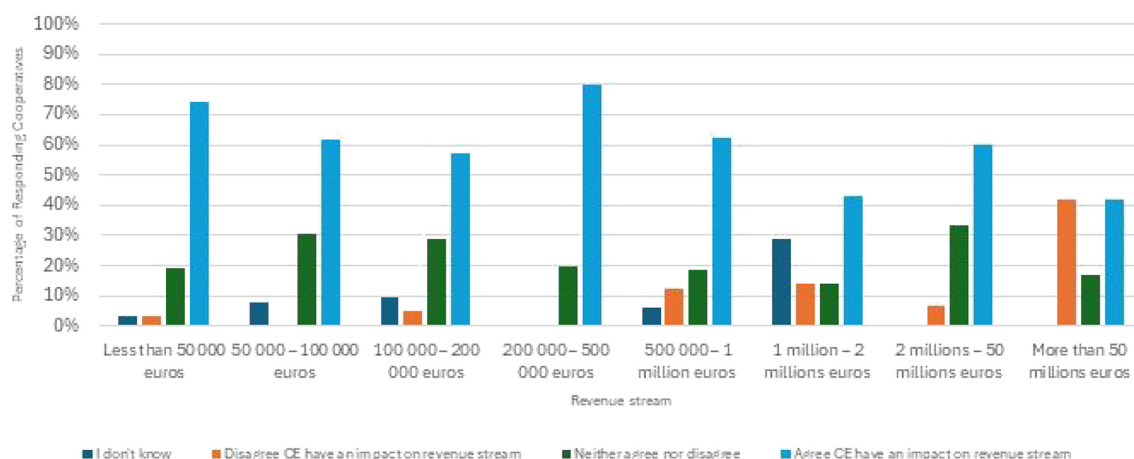
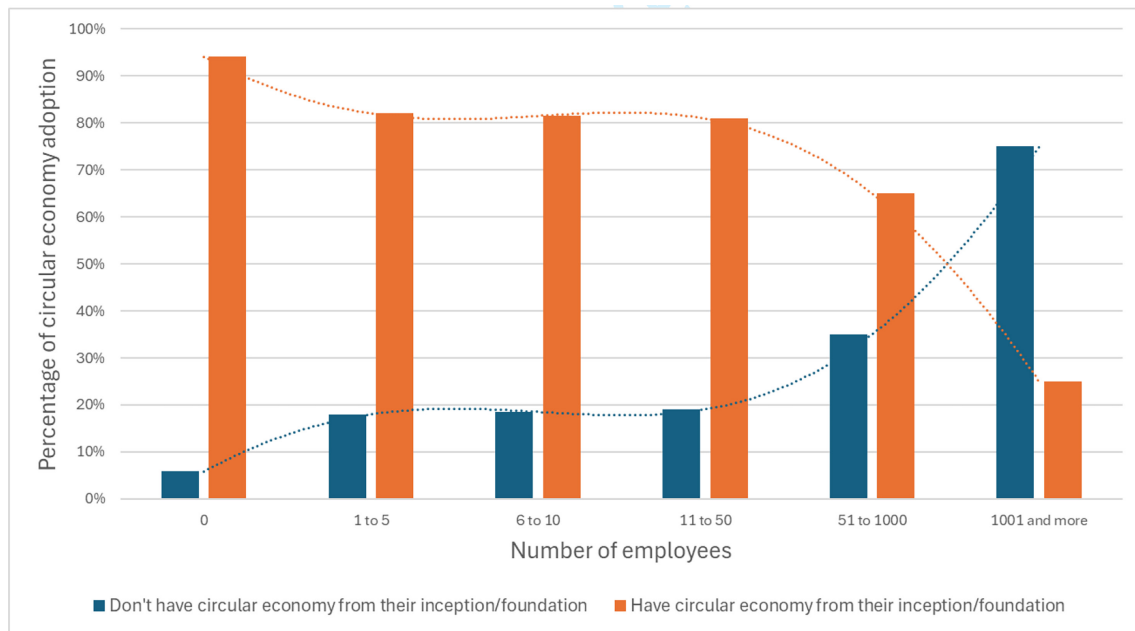
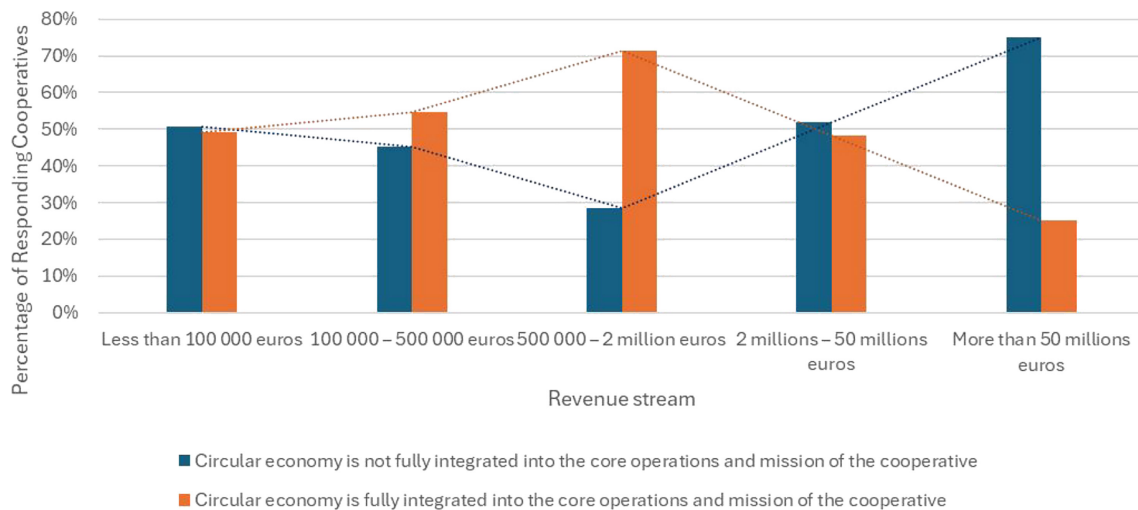


FIGURE 4 | Perceived impact of circular economy on revenue stream by annual turnover. ( $n = 135$ ).



**FIGURE 5** | Adoption of CE in relation to number of employees.



**FIGURE 6** | Annual turnover and circular economy integration ( $n = 134$ ).

that a majority of financial partners understand their approach (Q120). The cooperatives therefore might have found ways to internally and externally communicate their approach.

This relatively positive perception of the understanding of circular economy is complemented by a majority of cooperatives viewing the democratic governance of cooperatives as “an advantage for advancing” their circular economy approach (52% strongly agree, 28% somewhat agree,  $n = 139$ , Q50). A majority of cooperatives view the democratic governance of cooperatives as “an advantage for advancing” their circular economy approach (52% strongly agree, 28% somewhat agree,  $n = 139$ ). Asked in a follow-up question as to the “why” of their assessment, we coded the following results ( $n = 83$ ). A first, and large pattern corresponded to advantages flowing from democratic governance. The main reason put forward was that democratic discussion improves circular products and services (72% of responses). This reason was given in different

variations: a plurality of perspectives improves the problem perception, discussion legitimizes decisions with members, employees and partners, and supports transparency as well as a feeling of belonging of members who deliberate on what to do for the benefit of the community. The associative nature of cooperatives (Novkovic et al. 2022) is evident in the responses. Collective decision-making results in the alignment of purpose, collective benefits, and a broader social impact. “It allows everyone to feel involved in the process, becoming part of the community. Which allows generating more commitment to the circular economy” (open answer). The cooperative model is seen as an advantage “because the circular economy is based on a diversity of parties and is based on participation and collaboration” (open answer). For example, some respondents argued that this supported a circularity responsive to actual needs (5% of responses), and one that had additional and deeper impact via the education of members owners (4% of responses).

In addition, some respondents identified a value fit between the cooperative model and a long-term orientation required for sustainability (8% of responses). More subtly, they noted that the model preselects for members who share these values (5% of responses). Some respondents argued that circularity via traditional firms does not work (5%), and that by contrast the cooperative model enables circularity ecosystem building because it is not perceived as profit driven (5% of responses). “In our opinion, it is simpler to take on this role as a cooperative to bring together an ecosystem thanks to the cooperative image associated with the model. Basically, we are identified as an actor who does not seek profit in the first place but more to find a solution to help them avoid their waste” (open answer).

Further exploring the cooperative advantage, we asked why cooperatives adopted circularity strategies. The most important reason stated was “the mission and goals of the cooperative” as well as the “development of the cooperative and its impact,” whereas policy and technological innovation play much less of a role (see Table 3). Cooperatives see circularity strategy, and broader sustainability concern, as an integral part of the cooperative enterprise model, their missions and goals.

The responses suggest a difference with private enterprise, where research finds circularity adoption to be strongly driven first by financial motives and second by market demand of customers (Geissdoerfer et al. 2022, 4). They also suggest that in both the cooperative and the private enterprise case, policy and legal frameworks are generally not perceived as an important driver. However, cooperatives with a higher number of employees tend to view policy and legal frameworks—as well as the opportunity of cost reduction—as more important for circularity adoption than smaller cooperatives (Data S1: technical report charts, 109–112).

#### 4.3.1 | Partners and Intercooperation

A further distinct aspect of the cooperatives in our sample is revealed by the question of “most important partners” for the

circular economy approach: citizens/private individuals were perceived as important in a majority of cases, followed by other cooperatives and public partners (see Table 4).

According to the principle of intercooperation, cooperatives are expected to privilege other cooperatives as partners, from informal collaboration, coop to coop business, to federative structures with other cooperative organizations (Novkovic 2014). Intercooperation is in evidence in general: 79% of respondents say that they see social economy organizations as important partners. Circular cooperatives may therefore form goal-directed networks with cooperatives and other social enterprises with a shared purpose to achieve circularity, which moves it from an internal governance and management issue to an external network governance as well (Novkovic 2024).

The reasons provided for this distinct external coop governance model are primarily values and principles driven (Q48): 73% stated that they prioritize cooperatives to favor intercooperation (ICA Principle 6), and 79% because they share the same values. Open answers further enriched the reasons for intercooperation adding proximity (of other cooperatives) as well as combining strengths and learning from others. One respondent recognized that intercooperation is “economically beneficial to both of us,” while another stated “because we are a network, for an ecological stance” suggesting socio-ecological purposes behind forming the network as a political project.

In such extended governance groups, governance can follow the cooperative ideal of democratic governance, or hierarchy and control can prevail (Assens and Lemeur 2016, quoted in Novkovic 2024). The large majority of respondents characterized their mode of governance as democratic (71%), whereas 15% characterized it as hierarchical, with decisions driven by one partner. However, the economic dimension of these partnerships seems limited in the sense that a majority of respondents (53%) stated that revenues from their circularity approach are not shared among partners.

**TABLE 3** | Reasons for adopting circularity.

| <b>Why did you adopt your circularity strategy?<br/>(multiple options are possible)</b> | <b>N</b> | <b>%</b> |
|-----------------------------------------------------------------------------------------|----------|----------|
| Policy or legal requirement                                                             | 13       | 9%       |
| Development of the cooperative and its impact                                           | 92       | 66%      |
| Cost reduction                                                                          | 30       | 22%      |
| Request from customers                                                                  | 11       | 8%       |
| Technical new opportunity                                                               | 21       | 15%      |
| Our mission and goals                                                                   | 115      | 83%      |
| Result of a vote by our members                                                         | 9        | 6%       |
| Other:                                                                                  | 4        | 3%       |
| Total N                                                                                 | 139      |          |

**TABLE 4** | Most important partners.

| <b>Who are the most important partners of your circular economy approach?<br/>For example, for obtaining or sharing resources (multiple choices possible)<br/>- selected choice</b> | <b>N</b> | <b>%</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|
| Other cooperatives                                                                                                                                                                  | 60       | 43%      |
| Other social enterprises (beyond coops)                                                                                                                                             | 51       | 36%      |
| Private enterprise                                                                                                                                                                  | 48       | 34%      |
| Public partners (municipality, other levels of government)                                                                                                                          | 57       | 41%      |
| Citizens/private individuals                                                                                                                                                        | 74       | 53%      |
| Other                                                                                                                                                                               | 85       | 61%      |
| We do not have partners                                                                                                                                                             | 17       | 12%      |
| Total N                                                                                                                                                                             | 140      | 100%     |

#### 4.4 | Choice and Development of Technology

Because circular economy activities delivered through social economy organizing prioritize technology users, we would first of all expect the choice of technologies and their development to be embedded by the values and principles of users rather than by profit opportunities for capital (Ziegler, Bauwens, et al. 2023, 8). Technology is an instrument in circular economy: it refers to tools and methods as well as the competencies and knowledge required to put strategies into place. However, research also shows technology to be part of socio-technical systems with practices, production processes and ways of thinking yielding various lock-in mechanisms (Geels and Schot 2010). Due to the systemic character of technology, we would not expect the choice of technology to be straightforward or simple.

The value embedding was confirmed above with mission and vision being the primary reason for circularity adoption; and we also noted a preference for upstream strategies in support of a strong circular economy. However, the values and principles of the cooperative identity do not specifically spell out the role of technology (Ballon et al. 2024). This limits the quality of responses as we were not able to pose technology-related questions that draw on an accepted language use within cooperatives, and we faced pragmatic constraints not to expand an already comprehensive survey too much. There is a risk that technology is treated as a tool subject to principles and values, even though research on sociotechnical systems points to lock-in and path-dependency in socio-technical systems (Fuenfschilling and Binz 2018). Given the role of technology in circular economy strategies from eco-conception upstream to recycling and transformation downstream, this important but ambivalent topic therefore merits further attention.

**TABLE 5** | Cooperatives, circular economy, and technology.

|                                                                                          | N   | %    |
|------------------------------------------------------------------------------------------|-----|------|
| How important is technology for your cooperative?                                        |     |      |
| Very important                                                                           | 62  | 45%  |
| Important                                                                                | 48  | 35%  |
| Somewhat important                                                                       | 21  | 15%  |
| Not very important                                                                       | 8   | 6%   |
| Total N                                                                                  | 139 | 100% |
| Do you depend on technology provided by other actors for your circular economy approach? |     |      |
| Yes                                                                                      | 68  | 49%  |
| No                                                                                       | 71  | 51%  |
| Total N                                                                                  | 139 | 100% |
| Who is providing this technology?                                                        |     |      |
| Noncooperatives providers                                                                | 61  | 91%  |
| Other cooperatives                                                                       | 6   | 9%   |
| Total N                                                                                  | 67  | 100% |

Survey respondents confirmed the importance of technology with 80% deeming technology to be “very important” or “important” (see Table 5). Above we saw that technical novelty for commercial use in markets does not seem to be a priority (see Table 3). About half of respondents do not depend on technology provided by other actors; and 42% of respondents also said that they develop their own techniques, tools and technologies for their circular economy approach. For the technology development, according to their responses to a multiple options question (Q61), coops involve “competencies of employees and members” (69%); however, external help, such as of consultants, also plays a role (47%). The majority of these technology developers do not protect their technical creations (60%); those who do (21%) said they protect it as a commons (67%) or with patents (19%) (Q62–Q63). The priority of members in the development of technology, along with an open and commons approach to technology provide further aspects to characterize a circular coop approach and how they seek to advance their outlook based on autonomy and needs of members, even if constrained to some extent by external technologies.

Turning to these constraints, Table 5 shows that about half of the respondents (49%) said that their cooperative depends on others for the provision of technology for their circular economy approach. The overwhelming part of this dependence (91%) is not from cooperative providers. So is there a tension between the coop identity and the importance of technology on the one hand, and on the other, the dependence on noncoop providers as a de facto reality of many cooperatives? A tension between the goal to prioritize cooperatives in partnerships on the one hand and, on the other hand, prevailing noncoop partnerships? The literature on technological embeddedness suggests that the capacity to absorb and use technologies (Andersson et al. 2001) depends on embeddedness in business networks, which, if mostly noncoop, are likely to come with different values and priorities. So, are noncoop providers chosen because there is insufficient cooperative supply, or because the latter is too expensive, or because the choice of technology is not thematized as an issue? Our survey only surfaces this tension, but further research is called for to explore the cooperative stances towards technology in the circular economy.

Only about a quarter of respondents view their use of technology as cooperative (23% yes, 75% no, 22% I do not know, Q121). The former were asked to “specify the cooperative way in which they use technology.” Of the 32 responses, 50% failed to provide a meaningful answer or simply stated an instrumental, not coop specific use of technology, suggesting that the question was posed in a too generic manner or that reflection on cooperative use of technology in circular economy is not a topic with readily available answers among respondents. Nonspecific responses often referred to digital tools. Among the 50% of retained answers, we find the generic one, for example, “according to ICA charter/basic principles” but further coding of open answers suggests the following:

- *pooling of technology as the prevailing* “cooperative way of using technology (50% of retained responses). Pooling refers to the shared purchase of technology, making the technology available to members and sharing it with like-minded organizations.
- *cooperative ways of using digital technology* (19% of retained responses): use of software to include partners in joint

planning; developing of platforms to facilitate the activities of members (as in the example of a multistakeholder food-sharing platform); and the development of a digital platform to facilitate intercooperation.

- *Educating and informing about technology* (12.5%): “socializing” of technology through courses, workshops and meetings as well as using peer-to-peer learning; sharing of information on technology updates and developments.

In sum, the survey points to a diverse and ambivalent role of technology for cooperatives advancing circular approaches. On the one hand, the cooperative identity suggests a values and principles-based use and development of technology based on the involvement of members and the cooperative sharing of knowledge and skills. One example of this is cooperatives that explore a low-tech approach focused on the needs of members as well as simple, affordable, and comprehensible technologies with low environmental impact (ADEME 2025). On the other hand, we can expect many cooperatives to rely on noncooperative technology providers, and the open questions suggest that there are to date no well-established patterns of thinking and communicating about technology in circular coops. A more detailed analysis would be required to understand to what extent cooperatives can achieve a degree of autonomy from the technical macro-systems on which they depend, and if so, how.

#### 4.5 | Regional Embedding and Coop Community Support

Cooperatives as member-owned organizations, with workers and consumers having a sense of place and community and being generally less mobile than capital, can be conceptually expected to embed circularity in regional economies and regional value chains (Ziegler, Bauwens, et al. 2023, 9). An empirical study of Italian cooperatives focused on the territorial embeddedness of cooperatives, as their “attachment to particular territories and places,” and found it to have a positive role for circular economy adoption (De Bernardi et al. 2024).

Our survey supports the idea of regional embeddedness of the circular economy by cooperatives. 77% of respondents say that their most important customers and beneficiaries are in their region, and a further 33% in their country, with only 11% in another country (Q67). Likewise, the most important partners such as resource providers, wholesale and retail were in the majority in the region (29%) or in the country (37%), and with a larger share here “in another country” (29%), likely related to technology reliance noted in Section 4.4 (Q68). Thus, within the limits of an exploratory study, our survey lends support to the hypothesis that circular cooperatives tend to promote a regionally embedded orientation strongly as far as customers and beneficiaries are concerned, and, if to a lesser extent, as partners for resource provision.

The survey also asked to report on networks of support. A majority (58%) did not receive support from a cooperative network for their circularity approach (Q123). Those who did receive such support (34%) received it from sectoral cooperative federations (36%) and multisector cooperative federations (28%) (Q124). Open answers in addition mentioned support from coop

development organizations and further cooperative alliances and collectives. Coding of open answers ( $n=27$ ) regarding the kind of support received from cooperative networks suggests the following patterns:

- organizational support for the development of the organization as a cooperative (44% of responses);
- financial support and advice (33%);
- support via peer learning (15%); and
- networking support for finding business partners, visibility, and so on (15%).

The general coop (not circular economy specific) support clearly prevailed in the open answers, suggesting that coop networks play a role for entrepreneurs, groups, and communities with a circularity topic, but needing advice on the cooperative form. There was no evidence in the responses for dedicated circular economy support from established networks.

A majority of respondents (61%) did not receive support from circular economy actors in their region (Q126). Those who did receive support (37%), reported it from government (51%), researchers and universities working on circular economy (26%) and private foundations focused on circular economy related topics (10%) (Q127).

Beyond regional embedding, we also asked, via an open question, what help participants need with developing, implementing, and advancing cooperatives' circular economy approaches. We coded competency development as the major theme (60% of responses) with subthemes:

- training on specific strategies and their relation to circular economy (21%)
- financial training (18%)
- partnership development (15%)
- communication (12%)
- training on the documentation of impact (3%)

41% of respondents also said that they would be interested in a community of practice on cooperatives and circular economy (Q78). Coding of open answers shows as main areas of interest:

- further exploring specific circular economy strategies (13%),
- learning about circular economy in their sector (13%), and
- peer-learning from other cooperatives (11%).

In sum, this suggests a twofold role of the distinct cooperative community support structure: on the one hand, enabling new circular initiatives to learn about cooperative governance and finance to benefit from established good practices of coop creation and management; on the other hand, an opportunity to extend distinct circularity-focused support for cooperatives new and old, such as, for example, via dedicated communities of practice.

## 5 | Discussion

Our research reveals the emergence of new, typically small cooperatives that seem to incorporate circularity as a core value from their inception. These organizations tend to favor upstream circularity strategies, aligning with the concept of “strong circular economy” (Aggeri 2023; Ziegler, Poirier, et al. 2023). The preference for upstream strategies, such as rethinking consumption and product design, indicates a more fundamental approach to sustainability, going beyond innovation for commercial use in markets to reimagine modes of production and consumption beyond the economic growth imperative, and predominantly with a focus on regional beneficiaries.

Furthermore, our survey responses indicate that many cooperatives perceive a distinct “cooperative advantage” (Spear 2000) when it comes to circularity: beyond a response to market failures of the linear economy, there is a deeper link between the cooperative, democratic government model and circular economy. Moreover, the strong representation of cooperatives in sectors related to renewable resources reinforces their alignment with the “biological nutrients” wing of the circular economy model, which emphasizes regenerative practices and renewable resources, positioning cooperatives as potentially significant actors in the transition to more sustainable and just economic systems.

However, the relative absence of cooperatives in heavy industries in our sample (less than 1% in automotive and chemical industries) suggests on the one hand potential areas for coop expansion, and on the other hand a dependence of cooperatives on noncooperative partners for technical infrastructure from nonrenewable sectors. Strengthening a cooperative economy will also require strategic partnerships as well as exploring areas for future cooperative development. For research this implies a need to better understand both circular cooperatives that deliberately seek to reduce dependence on technology, such as cooperatives in agriculture and construction pursuing a “low-tech approach” (Bihouix 2020), as well as the different stances in relation to technology adoption from circular cooperatives when partnering with noncoop organizations, which our survey has shown to be often the case. Moreover, notably in relation to “low-tech approaches,” there is a critical distinction between the “implicit” adoption of circularity strategies and an explicit rejection of mainstream circular economy discourses focused on technology for green economy. Co-operatives could facilitate the “knowledge commoning” in support of “technoficing,” defined as “the purposeful pursuit of social objectives using a technology that is good enough and appropriate for the purpose of use” (Qureshi et al. 2021). Technoficing dovetails with sufficiency as value of needs-oriented organizations (Villalba-Eguiluz et al. 2023), and emphasizes the importance of tacit knowledge, notably for better understanding rural technology uses across the world, including those drawing on indigenous knowledge (Parthiban et al. 2024).

Because current economies are “linear,” extractive economies, there is much interest in the system-building activities of circular entrepreneurship and innovation (Bauwens et al. 2024). A distinct feature of the cooperative model is its tendency to create sectoral and intersectoral “meta-organizations” (Berkowitz 2018),

notably in the form of sectoral and intersectoral federations, which themselves benefit from the ecosystem-building activities of the cooperative movement (Lévesque 2016). Cooperatives thereby create spaces for mutualization, such as for sharing technology, in line with the cooperative principle of intercooperation. Our survey shows new circular cooperatives seek advice from such networks on challenges such as legal structure, governance, or marketing.

However, a crucial finding of our study is the current limited dedicated support for advancing circularity within existing cooperative networks, even though this might be specifically of interest for the many already established cooperatives. If cooperatives organizations have inherent characteristics that align with circular economy principles, this should support the integration of circularity strategies into their existing operations. The challenge for established cooperatives lies in adapting their existing structures and processes to more fully embrace circularity. This may involve rethinking supply chains, product designs, and service offerings to minimize waste and maximize resource efficiency. The exploration of circularity strategies by established cooperatives represents a significant opportunity for scaling up circular practices across various sectors. Therefore, the apparent gap in dedicated support by cooperative networks, highlights an opportunity for sectoral federations to advise and support domain specific circularity strategies, and for intersectoral federations to play a more active role in facilitating the deployment of circularity strategies among cooperatives across sectors. By developing targeted support programs, confederations could potentially accelerate the adoption of circular practices across sectors in line with Lévesque's (2016) observation that intersectoral federations have historically facilitated movement building. In so doing, they can also exercise their advocacy role to improve governmental support, not least as our survey already shows the latter to play an important role. Along the same lines, our survey suggests that deepening cooperation with circular economy research might improve the formation of supportive ecosystems.

Our survey results indicate a predominance of small to medium-sized organizations which lead to the question: would they have advantages in terms of flexibility and ability to quickly adopt new practices? However, they may also face challenges in terms of resource availability—particularly at scale—when implementing more resource-intensive circular strategies. This suggests a need for tailored support and potentially collaborative approaches to enable smaller cooperatives to fully engage in circular economy initiatives. A distinct cooperative opportunity is the support by larger cooperatives, such as credit unions, who again drawing on intercooperation, could provide resources, contracts and contacts. Beyond cooperatives, the small to medium size of organizations in the sample suggests that future research could explore the relation to small businesses, who might often face similar challenges. Such an extension of the sample would also enable a comparative exploration of choice of circularity strategy by sector.

There are both regional and global implications to our study, given that we cover 12 countries across Europe and the Americas. The roughly equal distribution of responses between European cooperatives and those from the Americas suggests

that the trend towards circularity in cooperatives is not limited to a single region. Our international perspective highlights the potential for cooperatives to play a significant role in global efforts towards sustainability and circularity but also emphasizes the importance of international cooperation and knowledge sharing among cooperatives to advance circular economy practices worldwide. As the cooperative advantage is also tied to historical contexts (Spear 2000), resulting in regions and countries with very different coop support systems, it would also be useful in further research to explore circularity adoption in relation to these different contexts.

## 6 | Conclusion

In this paper, we set out to explore how cooperatives embed circularity in their business models and governance, including in relation to their technology and partnership choices, and how the circular economy uptake by cooperatives is facilitated given their distinct values and organizational embedding. Through the analysis of this exploratory survey, we have contributed to knowledge in several key areas.

Firstly, we have found that cooperatives of our survey embed circularity in their business models, governance, technology, and partnerships through pursuing circularity as a core value from inception, especially in newer and smaller cooperatives. Cooperatives tend to favor upstream circularity strategies that align with the concept of a strong circular economy and focus on sectors related to the “biological nutrients” wing of the circular economy model. Their emphasis on shared ownership and mutualization naturally resonates with circular economy principles. Furthermore, cooperatives tend to make partnership choices that support circularity by seeking support from established cooperative networks for finance and legal advice, particularly for new circular economy-focused cooperatives, and rely on noncooperative partners for technical infrastructure, especially in sectors related to nonrenewable resources. It is important to note that while cooperatives are embedding circularity in various ways, there is untapped potential for support and facilitation within existing cooperative networks.

Secondly, we have found that the circular economy uptake by cooperatives of our sample is facilitated in ways that take account of their distinct values and organizational embedding. The values and principles of cooperatives align with circular economy concepts, which seems to support them to adopt circularity strategies. While new circular economy-focused cooperatives can seek support from existing cooperative networks, established cooperatives, especially larger ones, look for ways to integrate circularity strategies into their existing operations. The democratic nature of cooperatives seems to facilitate the adoption of circular economy practices through participatory governance as their emphasis on shared ownership and mutualization naturally supports circular economy principles. However, we also revealed that there is currently limited dedicated support for advancing circularity within existing cooperative networks, suggesting an opportunity for sectoral and intersectoral federations to play a more active role in facilitating the deployment of circularity strategies among cooperatives. The facilitation of circular economy uptake by

cooperatives is thus a combination of inherent organizational characteristics and external support structures, with potential for further development in dedicated circularity support from established cooperative networks.

It is important to acknowledge the limitations of our study. Our sample is mostly based on small and medium-sized organizations, and the distinct role of larger cooperatives therefore less in the focus. For example, credit unions and co-operative insurers—which are large and significant organizations in some jurisdictions—are absent altogether. Additionally, the focus of our study on Europe and the Americas leaves gaps in our understanding of cooperative involvement in circular economy practices in Asia-Pacific and Africa. Future research should aim to address these gaps by expanding the geographical scope to those continents; developing methods to better capture data from larger cooperatives and financial institutions; conducting follow-up in-depth case studies to understand the practical challenges and successes of implementing circular strategies in cooperatives; support sectoral and intersectoral federation with action-research on circular coops; and exploring the potential of cooperatives in facilitating circular economy transitions in heavy industries and nonrenewable resource sectors. It would also be of interest to understand the links between the development of circular cooperative models in relation to the cultural, economic, and legislative context of different regions and countries, and to revisit survey results by country on this basis.

## Author Contributions

**Rafael Ziegler:** conception and co-lead across themes, collection of data and analysis – original draft, review and editing – supervision. **Jonas Rey-Sierro:** collection of data and analysis, visualization. **Sonja Novkovic:** conception (lead governance theme), data analysis – original draft and review. **Inmaculada Buendía-Martínez:** conception (lead business model theme), support data collection, analysis – original draft and review. **Justine Ballon:** conception (lead technology theme), data analysis – original draft, review and editing. **Simon Teasdale:** conception (lead regional embedding theme), data analysis – original draft, review and editing. **Michael J. Roy:** conception (lead discussion), data analysis – original draft, review and editing.

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## Conflicts of Interest

The authors declare no conflicts of interest.

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### Supporting Information

Additional supporting information can be found online in the Supporting Information section.