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PERSPECTIVE

Multi-Stakeholder Data Sharing for the Circular Economy

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Abstract

The transition to a circular economy (CE) depends on effective data sharing across fragmented value chains. Although digital technologies enable the tracking of resources, products, and processes, relevant data are dispersed among stakeholders with divergent interests, capabilities, and regulatory constraints. This article conceptualizes multi-stakeholder data sharing as a central governance challenge for the CE and identifies three core tensions: transparency versus confidentiality, granularity versus feasibility, and multiplicity of platforms versus standardization. We derive implications for governance frameworks and we outline key directions for future research.

Keywords Data Sharing · Multi-Stakeholder · Circular Economy · Digital Technologies · Digital Product Passport

1. Introduction

The concept of a circular economy (CE) represents an economic paradigm that rejects the single use of resources and instead promotes systems that regenerate by keeping resources in use (Kirchherr, 2017; Stahel, 2019). Both scholars and practitioners identify the digital transition as a key enabler of the shift towards a CE (Ciulli et al., 2020; Chauhan, 2022). Central to this transition is data, as it provides critical insights into resources, products, and processes along value chains and can thereby facilitate the adoption of circular practices. However, value chains are typically fragmented across multiple actors, meaning that relevant data are dispersed among stakeholders who have different roles, incentives and infrastructures, and are embedded in diverse institutional contexts (Ponte et al., 2019). As a result, effective "multi-stakeholder data sharing" becomes essential but also highly complex. In this article, we highlight the importance of multi-stakeholder data sharing for the CE, outline key challenges associated with it, and derive implications for governance and future research.

2. Multi-stakeholder data sharing for the CE

The collection and use of data on resources, flows, products, and CE-related activities are widely seen as critical for enabling the circular transition (Jabbour et al., 2019; Vial, 2022). For example, when manufacturers share data on products and components, other actors in the value chain, such as repairers, remanufacturers, or recyclers, can contribute to extending product lifecycles or closing resource loops. An exemplary manifestation of such data sharing efforts in the CE context is the Digital Product Passport (DPP), which can have a significant impact on CE decision-making processes if used efficiently (Gieß & Möller, 2025; Jensen et al.,

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2025) Yet, the data for the DPP must be provided by a wide range of stakeholders operating across organizational, sectoral, and national boundaries, who often have divergent interests, capabilities, and infrastructures, which makes organizing and governing efficient data sharing particularly challenging (Ducuing & Reich, 2023). Based on an empirical research project around the development of the DPP, we identify three core tensions inherent in multi-stakeholder data sharing for the CE (Henry & Ciulli, 2025). Although this does not present an exhaustive list of tensions in this context, these emerged as particularly illustrative throughout the process.

3. Tensions inherent in multi-stakeholder data sharing for the CE

3.1. Tension 1: Transparency versus confidentiality

A first challenge concerns managing the trade-off between data transparency and confidentiality. Transparency is crucial for circular practices, as their implementation depends on the availability and quality of shared data. Sharing data transparently enables actors to understand product characteristics and state of health, material composition, and origin, thereby supporting informed circular decision-making. Transparency also allows actors to measure, monitor, and demonstrate the impacts of circular initiatives. At the same time, many actors are reluctant to share data beyond what is strictly required, as they fear that disclosing sensitive business information could weaken competitive advantages. Moreover, the costs and benefits of data sharing are unevenly distributed across value chains. While some actors face relatively low costs, others, particularly upstream manufacturers, may bear higher costs. Additional concerns relate to compliance with legal, regulatory, or contractual obligations, as well as divergent views on data governance and control. These factors strongly influence actors' willingness to engage in transparent data sharing.

3.2. Tension 2: Granularity versus feasibility

A second challenge concerns determining the level of data granularity at which CE-related data should be shared. Data can range from highly granular information on individual products (e.g., a specific battery) to aggregated data on batches or product models. High data granularity offers clear benefits: it supports long-term circularity goals and allows different stakeholders to extract value from the data according to their needs. While consumers may only require basic information, other stakeholders such as repairers, recyclers, and remanufacturers often depend on detailed data to carry out circular activities effectively. However, providing granular data raises feasibility concerns as this requires advanced technical infrastructures, thereby increasing complexity and implementation costs. Moreover, although not all stakeholders should access the same level of detail, determining and managing access rights becomes difficult. Furthermore, the burden of collecting and maintaining detailed data often falls on smaller or more marginal actors within value chains, who may lack the financial or technical resources to do so.

3.3. Tension 3: Multiplicity of platforms versus standardization

A third challenge concerns deciding whether data sharing should rely on multiple platforms or be standardized across fewer systems. Some stakeholders favor a multiplicity of platforms, as this can prevent monopolies, preserve technical flexibility, and enhance data security. Multiple platforms may also allow organizations to choose solutions that best fit their specific needs.

Conversely, many stakeholders emphasize the importance of standardization to ensure efficient data sharing. Standardization can reduce complexity, prevent information asymmetries, and avoid fragmentation caused by incompatible systems, standards, and infrastructures. Without sufficient standardization, data sharing may remain limited, and fragmented platforms may create data silos that undermine collaboration across value chains, hindering circularity. An overview of these tensions is provided in Figure 1.

4. Governance implications

These tensions have important implications for governance. We identify three key areas for policymakers and other actors seeking to foster multi-stakeholder data sharing for the CE.

First, governance frameworks must balance transparency requirements with the protection of confidential business information. This includes mandating sufficient data transparency to enable circular practices and impact monitoring, while safeguarding sensitive commercial data, ensuring regulatory coherence, and addressing the unequal distribution of risks and benefits across value chains. *Second*, policymakers must determine appropriate levels of data granularity that support CE objectives without imposing disproportionate technical or financial burdens on specific actors. This involves defining minimum data requirements, establishing differentiated access rights, and preventing the externalization of data provision costs to smaller or less powerful stakeholders. *Third*, data-sharing infrastructures should combine interoperability and efficiency with diversity and competition among platforms. Policymakers need to decide the extent of standardization necessary to avoid fragmentation and data silos, while preventing platform monopolies and preserving data security and technological flexibility.

5. Research questions

For academics, several research questions emerge as particularly relevant for advancing knowledge on data sharing for the CE.

- How do actors across value chains negotiate and respond to the trade-offs inherent in multi-stakeholder data sharing? While existing studies highlight different coping strategies for actors confronted with trade-offs (Jarzabkowski & Lê, 2017), the digital nature of data sharing may require new or adapted approaches, including novel uses of technological tools.
- What value do different actors associate with data transparency? Prior research shows that perceptions of value differ across actors, including in the CE context (Tapaninaho & Heikkinen, 2022). Understanding these differences is crucial for designing effective data-sharing arrangements.
- How do different platform configurations, such as single, federated, or multiple platforms, affect data interoperability, trust, and collaboration in circular economy ecosystems? Research suggests that platform design plays a key role in realizing CE benefits (Blackburn et al., 2023; Ciulli et al., 2020), calling for more empirical insights on this matter.

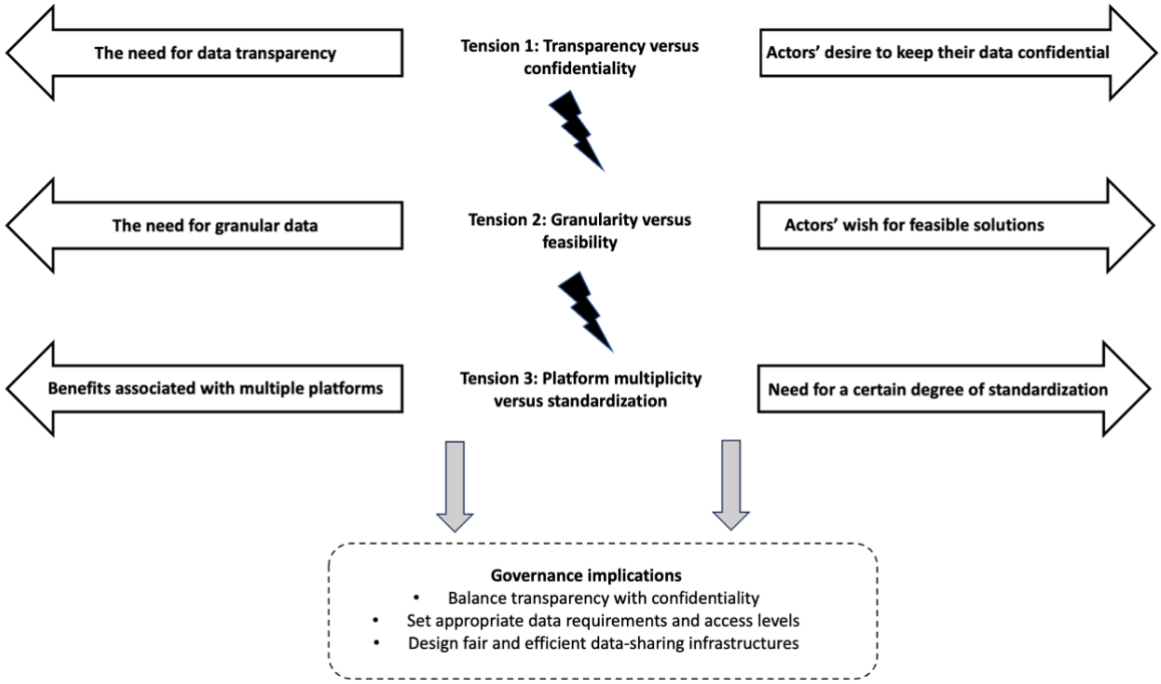

Figure 1. Tensions in multi-stakeholder data sharing for the CE and governance implications

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Declarations

Competing Interests The authors declare no competing interests.

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