Innovating Civil Engineering: Strategies for Fostering Stakeholder Engagement in the Circular Economy

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Abstract: Sustainability and circular economy principles are increasingly important in civil engineering, as highlighted by the United Nations Environmental Programme in 2023 the construction activities represented 36% of global energy use in 2020. However, the sector's focus on reducing operational carbon overshadows the need for addressing embodied carbon from materials like cement, steel, and aluminium. To address this, a shift towards incentivizing all supply chain stakeholders and cultivating collaborative models is necessary. This research provides an initial scoping for the development of the Lithuanian Construction Materials Reuse Optimization (LSEPO) platform, a pioneering regional initiative fostering a marketplace for reused building materials. Such platforms are recognized for their potential to overcome sustainability barriers by utilizing digital technologies for efficient data management and stakeholder collaboration. Our research identifies a significant gap in the existing literature concerning effective stakeholder engagement strategies critical for the success of such platforms. To bridge this gap, we employed a three-tiered methodological approach: firstly, a semi-structured literature analysis delved into existing stakeholder engagement strategies within the circular economy. This review highlighted a fragmented understanding of incentives and collaboration dynamics across different sectors. Secondly, a content analysis of global material exchange and circular construction platforms provided insights into best practices, showcasing successful communication methods, innovative incentive models, and robust collaboration frameworks. Lastly, integrating these findings, our study proposes a conceptual stakeholder engagement framework tailored for social innovation in civil engineering, more specifically Lithuanian Construction Materials Reuse Optimization (LSEPO).Practical implications of our findings underscore the necessity for platforms like LSEPO to incorporate adaptive engagement strategies that are context-sensitive and inclusive, facilitating a broad spectrum of stakeholder inputs. The study demonstrates that effective stakeholder engagement goes beyond traditional communication methods; it requires a systemic integration of technological innovation and incentive alignment to promote sustained participation and collaboration. By providing a comprehensive foundation for the development of the LSEPO platform, this research not only aims to advance it as a beacon of social innovation and environmental stewardship within the civil engineering sector but also sets a benchmark for future initiatives aiming to embed circular economy principles effectively.

Keywords: Circular economy, Civil engineering, Co-creation, Stakeholder engagement

1. Introduction

In the quest for sustainable civil engineering, the circular economy (CE) emerges as a central framework, underpinned by alarming environmental statistics and a pressing need for systemic transformation. The United Nations Environmental programme (2023) report underscores the construction sector's substantial share of global energy consumption, sitting at 36% in 2020, and a similar proportion of CO2 emissions. Beyond these figures lies a more granular challenge: the reuse of building materials. Despite over 90% of a building's content being potentially reusable, the World Economic Forum (2014) revealed that only a meagre 20–30% of these resources find a second life post-demolition. The pathway to resilience, therefore, hinges on reshaping production and consumption patterns towards a circular model—a transition that not only mitigates environmental impacts but also boosts socio-economic indices such as GDP and job creation (Hieminga, 2015).

As the CE gains momentum, digital platforms emerge as powerful tools in the push for sustainable civil engineering. Digital technologies hold the promise of revolutionizing waste management and recycling processes by enabling predictive analytics and optimization that are crucial for the CE. Kovacic et al. (2020) argue that these technologies not only facilitate the reduction of waste but also streamline its reintegration into the production cycle. The capabilities of digital platforms to ensure traceability and foster confidentiality, transparency, and reliability are invaluable in enhancing the efficacy of circular projects and minimizing their environmental footprint (Charef, 2022). However, there remains a substantial gap in fully engaging the diverse array of stakeholders involved in the construction industry's lifecycle. The development and success of online

platforms are inextricably linked to effective stakeholder engagement, a component that is still not sufficiently leveraged in the sector. Addressing this, our research pivots to a question that is both pertinent and pressing: *How can the construction industry better harness digital platforms to enhance stakeholder engagement, thereby facilitating the adoption of CE principles?*

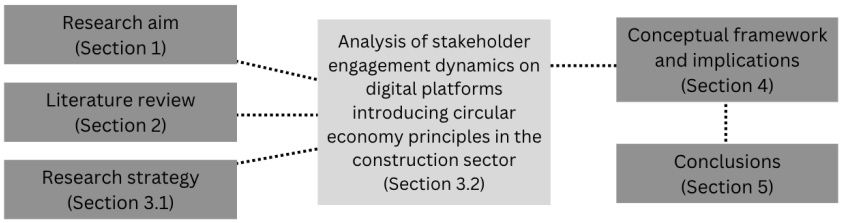

Figure 1: Logic of the inquiry

This inquiry delves into the current landscape of research, seeking to identify and bridge the gaps in stakeholder collaboration for a truly circular and sustainable built environment (see Figure 1). Through this exploration, we aim to articulate strategies that foster a more cohesive, informed, and proactive stakeholder community, which is vital for realizing the full potential of CE within civil engineering. The culmination of this research is to pave the way for the Lithuanian Construction Materials Reuse Optimization (LSEPO) platform, which aspires to become an example of social innovation and environmental responsibility, leading the civil engineering sector in Lithuania and the region towards a more sustainable and circular future.

2. Literature Review

The CE opposes the traditional linear economic model—a systemic shift advocated for by thought leaders in response to the unsustainable nature of current global consumption and production patterns. Historically, the global economy has been characterized by a linear "take-make-dispose" model, resulting in significant resource extraction, commodity volatility, and the generation of waste (Hieminga, 2015). The EC, conversely, proposes a paradigm where economic growth is decoupled from finite resource use, promoting the continual use of resources and minimizing waste. In the construction sector, however, the concept of CE remains nascent and fragmented. Various interpretations of CE exist (Kirchherr et al., 2017), and a coherent, universally accepted definition within the construction industry has yet to emerge (Adams et al., 2017). This has led to divergent initiatives, ranging from design for deconstruction, the hierarchy of construction and demolition waste management, to the development of secondary materials markets and urban mining. The transition to CE in construction is further complicated by a dichotomy in approaches: the top-down strategies led by policy and governance, contrasted with bottom-up initiatives steered by social innovation and grassroots movements (Munaro & Tavares, 2023). This dichotomy raises questions about the roles and responsibilities of various stakeholders in driving the sector towards circularity. Hence, understanding the heterogeneous landscape of stakeholder interests is paramount.

The investigations on the role of stakeholders in the CE within the construction sector is gaining prominence. Adams et al. (2017) identified a significant knowledge gap amongst key players such as customers, designers, and subcontractors concerning CE, highlighting barriers such as inadequate incentives for end-of-life design and unclear economic benefits. As Chinyio and Olomolaiye (2010) categorized, stakeholders can be internal, like project professionals and suppliers, or external like the public and government bodies, each wielding varying degrees of influence over organizational objectives and projects. The complexity of stakeholder relationships in construction projects is further magnified in CE due to the addition of roles such as demolition contractors and recycling plants, which contribute to a more complex supply chain network (Chen et al., 2022). Finally, Volk et al. (2019) developed a CE framework to encapsulate the intricate web of stakeholder interactions and material flows within construction, a domain often overlooked, impacting decision-making and policy formulation. This approach revealed that establishing clear communication channels and building trust between diverse stakeholders can foster stronger and more cohesive partnerships (Hart et al., 2019), which is essential for navigating the CE transition in construction.

The integration of information and communication technologies is recognized as a crucial enabler for CE within the construction sector (European Commission, 2020). They enhance information flow and communication among value chain stakeholders, a necessity for CE transformation identified by the Wuppertal Institute (Wilts & Berg, 2018). However, the role of specific functions of digital technologies in promoting circularity is still not fully understood (Wynn & Jones, 2022). The research gaps articulated by Wilts & Berg (2018) emphasize the

need for detailed information on the quality and quantity of secondary materials, the reduction of transaction costs, the consideration of externalities in pricing, and the integration of recyclability in product design. Addressing these gaps requires enhanced coordination among stakeholders and is critical for the successful implementation of CE in construction. Digital platforms (such as secondary material exchange platforms) are acknowledged as a important instrument for catalyzing stakeholder collaboration and accelerating the adoption of CE principles in the construction sector (Charef, 2022; Rodrigo, 2024). Yet, despite their potential, the dynamics of stakeholder engagement on these platforms remain underexplored in scholarly work.

Given the gaps in literature on stakeholder dynamics, several focal points for further analysis emerge: (1) *motivation for knowledge sharing and collaboration*: understanding the incentives for knowledge exchange is key to fostering collaboration (Adams et al., 2017). Platforms must provide robust systems for information sharing that align with stakeholders' interests and needs; (2) *collaborative decision-making functions*: identifying effective digital decision-making functions that can incorporate the diverse perspectives of the industry's stakeholders (Chen et al., 2022); and (3) *stakeholder engagement dynamics*: analyzing engagement strategies on digital platforms to determine their effectiveness in promoting CE practices within the sector (Hart et al., 2019). By addressing these three elements, the paper will explore the intricacies of stakeholder dynamics and their implications for advancing CE in the construction sector, aiming to inform the development of robust digital platforms that catalyze this shift.

3. Analysis of Stakeholder Engagement and Collaboration Strategies in Online Platforms

3.1 Methodological Approach to Platform Content Analysis

To ensure a nuanced understanding of stakeholder engagement best practices in the context of global material exchange and circular construction platforms, our study adopts a qualitative content analysis methodology. This approach is particularly suited for exploring complex phenomena within specific contexts, allowing for a rich, contextual comprehension of the core phenomena without striving for universal applicability. The qualitative content analysis method, as detailed by Kim and Kuljis (2010), enables the condensation of extensive raw data into meaningful categories and themes, fostering valid inferences and interpretations tailored to our research objectives. Our choice of this methodology aligns with its frequent application in studies that require an in-depth exploration of communication contents and stakeholder interactions, similar to ours. As Mayring (2004) suggests, this approach is inherently communications-centric, making it ideal for examining the dynamics of material exchange platforms. It provides a structured yet flexible framework to deeply explore the specific cases we have selected, which are crucial for gaining insights into the actors involved, the types of collaborative activities, and the pursued goals. Moreover, it allows us to discern and articulate the interconnections and synergies among various stakeholders effectively. By employing qualitative content analysis, our objectives are twofold: firstly, to extract and categorize critical aspects of stakeholder engagement, and secondly, to identify emergent patterns and synergies that may influence the effectiveness and sustainability of material exchange initiatives

Sample. In determining the selection criteria for material exchange and circular construction platforms, our study employs purposive sampling. This approach is necessitated by the inherent challenges in defining a complete universe of online platforms due to the absence of an obligatory registry for such operations. Consequently, constructing a strictly statistical frame for random sampling is unfeasible, aligning our methodology with the conditions described in studies like those by Pałka et al., 2024, and Bajaj et al., 2021, where similar methodological constraints are addressed. The platforms included in the study were selected based on the definition of material exchange platforms which encompasses platforms that enable stakeholders to connect and collaborate for material reuse and recycling (Wu et al., 2022; Caldera et al., 2020). The selection criteria for material exchange and circular construction platforms are as follows: (1) *interactivity* (platforms should foster open, inclusive, and collaborative engagement); (2) *contributors* (the platforms should be capable of involving a substantial number of participants); (3) *collective action* (platforms should facilitate collaborative actions among diverse stakeholders); (4) *data availability* (information about goals, metrics, and initiators should be publicly accessible on the platform's website) and (5) *sustainability impact* (platforms should demonstrate a measurable positive impact on sustainability, such as reducing carbon footprint, promoting energy efficiency, or contributing to the conservation of natural resources).

The selection was conducted through analysis of European Circular Economy Stakeholder Platform. The European Circular Economy Stakeholder Platform, launched in March 2017 by the European Commission and the European Economic and Social Committee, serves as a dynamic hub for stakeholders to accelerate the

transition to a CE in Europe through idea exchange, information sharing, and collaborative events including an annual flagship conference. The resulting sample of platforms together is presented in Table 1 below.

Table 1: Material exchange and circular construction platforms in the sample

Platform	Focus	Platform	Focus
SalvoWEB	Reclamation and re-use	Ecocycle	Construction demolition materials
BuildReuse	Construction and demolition waste	Restado	Reclaimed construction materials
Green Building Information Gateway	Green buildings	Circular Building Knowledge Platform	Circular buildings
Concular	Circular material flow	Rheaply	Resource utilization
Material reuse portal	Reuse of construction materials	Circular homes	Facilitation of circular renovations
Loopfront	Reuse of building materials		

Data collection procedure. Data collection began with the creation of a standardized data collection template (see Table 2 below). This template was segmented into (1) *motivation for knowledge sharing and collaboration*, (2) *collaborative decision-making functions* and (3) *stakeholder engagement dynamics* based on the insights of literature review on stakeholder engagement in CE. The team of researchers analyzed the content of the platforms, related websites and social media activity. Only publicly available data were collected for analysis. No information on the users of the platform were collected during the procedure. Data collection activities were conducted in the period from October, 2023 to January, 2024.

Table 2: Template for data collection

Element	Category	Subcategories & descriptions
Motivation for knowledge sharing and collaboration	Platform goals	The drive and incentives behind the sharing of knowledge and cooperative efforts, crucial for nurturing CE principles and sustainable practices in the construction sector.
	Key user/audience groups	User groups that are targeted for knowledge sharing and collaborative outreach (e.g., architects, general public, contractors, public officials).
Collaborative decision-making functions	Initiators and developers	Identify individuals and/or organizations that initiate decision-making systems i.e., who is in charge of the processes and what is the hierarchy of leadership.
	Strategic functions facilitating collective action	The environment or platform features that foster collaboration, like forums or project management tools. Subcategories like analytical tools, databases for material reuse, and BIM systems that aid in decision-making.
Stakeholder engagement dynamics	Engagement and collaboration strategies	Methods, processes and approaches that encourage trust-building and collaboration (e.g., transparency initiatives, stakeholder meetings, or community engagement strategies).
	Partnerships formed	Collaborative partnerships formed (e.g., joint ventures, industry-academia collaborations, or community projects).

Data analysis. Subsequent stages involved systematic coding of platform content and assessing the dynamics and design of the platforms based on the dimensions outlined in the Table 2. The coding was conducted using qualitative content analysis software Nvivo. A comparative analysis across the platforms then provided insights into best practices in stakeholder engagement and collaboration.

Limitations. While the methodology has been robustly designed, it is important to note its limitations. The heterogeneity of data available online presents challenges due to variability in content, semantics, and user interfaces. Additionally, the sample size, while curated, is not exhaustive and hence may not be fully representative of the broader landscape of such platforms.

3.2 Results of Platform Content Analysis

3.2.1 Motivation for knowledge sharing and collaboration

Understanding the incentives for knowledge exchange is key to fostering stakeholder collaboration. In this regard, the sample of material exchange and circular construction platforms is characterized by a diverse array of goals and objectives, ranging from the promotion of reuse and recycling to fostering collaboration and

community engagement. The objectives of the platforms, as outlined in Table 3, illustrate a commitment to collaborative value creation that extends beyond the traditional confines of economic gain. These platforms, by facilitating the exchange of reclaimed materials, providing analytics for green building, optimizing material flow through technological innovation, centralizing knowledge for circular construction, and offering digital tools for sustainable living, contribute to a broader value proposition. This proposition is multi-faceted, encompassing environmental stewardship, education, and community engagement, thus resonating with the missions of the respective organizations.

Table 3: Categories of platforms based on their core goals

Categories	Platforms in the sample	Description
Marketplaces for reclaimed materials	SalvoWEB Restado	Platforms in this category function as digital marketplaces that connect sellers and buyers of reclaimed building materials. They are pivotal in creating a supply chain for repurposed materials, thereby minimizing waste and encouraging the reuse of resources within the construction industry.
Green building analytics and reporting	Green Building Information Gateway (GBIG)	This theme encompasses platforms that aggregate and analyze data related to green building practices. They offer analytical tools for assessing sustainability metrics and facilitate the sharing of green building achievements, contributing to a data-informed approach in the construction sector.
Circular economy and innovation in material flow	Concular Ecocycle	Platforms under this umbrella utilize cutting-edge technology to optimize the lifecycle of building materials. Through innovative approaches such as artificial intelligence and proprietary recycling techniques, they support the CE by enhancing material traceability and reuse.
Centralized knowledge hubs for circular construction	Circular Building Knowledge Platform Material Reuse Portal	Included here are platforms that compile and disseminate information on circular construction. They act as centralized knowledge repositories, providing access to research, best practices, and policy information that underpins the shift towards sustainable construction methodologies.
Digital tools for sustainable living and construction	Circular Homes Loopfront	This category represents platforms that offer digital tools and resources for implementing sustainable and circular practices in living spaces and construction projects. They aim to empower stakeholders with the means to undertake environmentally conscious renovations and developments.

Additionally, based on the content analysis of the platforms in the sample, the audience and user base can be categorized into four pivotal groups, each contributing uniquely to the advancement of CE principles within the construction sector: (1) *construction industry professionals* form the backbone of these platforms, encompassing architects, builders, demolition contractors, and engineers who actively seek and list sustainable materials; (2) *regulatory actors and policy influencers*, including urban planners, local government authorities, and environmental NGOs, are integral to shaping the ecosystem; (3) *educational and research entities* such as universities and research institutions; and (4) the *end-users*, ranging from individual property owners and DIY enthusiasts to large corporate entities managing real estate portfolios. These groups represent within which circularity in construction is not merely an aspirational goal but an operational reality. The platforms in the sample showcase a synergistic network with heterogenous actors and resources is needed to push the industry toward a CE.

3.2.2 Collaborative decision-making functions

The architecture of decision-making and support systems within digital platforms for circular construction and material exchange reflects the leadership and vision that drives them. Understanding the entities behind these platforms is essential because their philosophy, strategic goals, and operational focus directly influence the way decisions are made and how the platforms are structured to support those decisions. The analysis of the platforms in the sample allowed to identify following groups of initiators/developers: (1) *visionary founders* are often individuals or small teams ignited by a passion for sustainability and circularity; (2) *dedicated non-profit organizations* emerge as a collective of like-minded individuals who, driven by a shared mission rather than profit, pool their resources and expertise to advocate for and implement circular practices; (3) *institutional developers* such as university labs, government-funded research projects, or initiatives backed by professional councils like the U.S. Green Building Council, harness academic rigor, policy knowledge, and a broad network of professionals to construct platforms that are rich in content and authoritative in their domain; and (4) *Corporate drivers* are companies like Holcim, which spearhead platforms with the aim of scaling circular technology solutions across global markets. The examination of digital platforms in the sample reveals a rich

diversity in the approaches to initiation and development, encompassing both grassroots, bottom-up movements as well as structured, top-down strategies. This diversity not only enriches the industry's capacity for innovation but also highlights the importance of tailored approaches that resonate with the unique contexts and stakeholders within the sector.

To fully grasp the transformative potential of digital platforms in fostering sustainability within the construction sector, it is also important to look beyond just the initiators and delve into the operational mechanisms these platforms employ. The ways in which they implement collective actions and drive the adoption of CE principles are as crucial as the vision that sparked their creation. Circular construction and material exchange platforms that have been studied demonstrate a variety of methods to galvanize collective action with Table 4 presenting a comparative view.

Table 4: Strategic functions facilitating the collective action

Platform	Matchmaking & marketplace	Educational & advocacy	Technological innovation	Community building
SalvoWEB	✓	✓		
BuildReuse		✓		✓
Green Building Information Gateway	✓	✓		
Concular	✓	✓	✓	✓
Material reuse portal	✓	✓	✓	
Loopfront	✓	✓	✓	✓
Ecocycle		✓	✓	
Restado	✓	✓		
Circular Building Knowledge Platform	✓	✓		✓
Rheaply	✓	✓	✓	✓
Circular homes	✓	✓		✓

Each function reflects a specific approach to catalysing collaboration and advancing the sector's objectives. More specifically, *matchmaking and marketplace* features create efficient channels between suppliers and consumers of reclaimed materials, fostering a transactional backbone that sustains the circulation of materials. In case of *educational and advocacy* functions, the efforts are made by the to not only share information but also to shape industry norms and influence policy, promoting broader adoption of circular principles and enhancing collective understanding and best practice dissemination. *Technological innovation* is another function identified which leverages cutting-edge technologies to bring transparency and efficiency to the lifecycle management of construction materials. Finally, *community building* activities are essential to forge and fortify the networks of practice and support, evident in platforms that offer collaborative forums and campaigns, strengthening the sector's social fabric and driving concerted action towards sustainability goals. Our findings highlight the diverse methods through which current platforms catalyse collaboration. Looking forward, there is a valuable opportunity to explore how these functions operate in practice, to refine them, and to innovate further. By doing so, future digital platforms can enhance their effectiveness in promoting the adoption of CE principles and in supporting the industry's transition to sustainable operations.

3.2.3 Stakeholder engagement dynamics

The content analysis suggests that the strategies for stakeholder engagement are not monolithic across these platforms; rather, they are as varied as the stakeholders themselves. After the analysis of platform content, our research group consolidated engagement and collaboration strategies of circular construction platforms into (1) *community and trust*: strategies that cultivate a cohesive user community through trust-building measures, such as codes of conduct and active engagement on social media. These methods aim to foster a sense of shared purpose and commitment to circular principles among all participants; (2) *education and resources*: this include efforts to develop and disseminate educational content, such as wikis, forums, and training programs. The focus is on empowering stakeholders with the knowledge and tools necessary to implement and advocate for circular construction practices effectively; (3) *policy and advocacy*: strategies

under this category aim to influence policy and promote industry collaboration. They involve engagement with policymakers, industry leaders, and other key stakeholders to align regulatory frameworks with the goals of the CE and (4) *technological empowerment and accessibility*: platforms leverage digital tools to facilitate stakeholder participation in the CE. This includes intuitive online marketplaces, digital documentation of materials, and platforms that provide clear insights into the environmental and economic impact of users' activities. These categories represent a strategic approach to engaging various stakeholders in a way that promotes collective action and supports the overarching mission of transitioning to a circular construction economy. Each platform's decision-making and support systems reflect an understanding that stakeholder engagement is not a one-size-fits-all solution. The diversity in approaches demonstrates a tailored approach to involving stakeholders in meaningful ways.

Finally, in the realm of circular construction and material exchange platforms, strategic partnerships play a vital role in expanding capabilities and enhancing the impact of these initiatives. Platforms have formed alliances across a broad spectrum of stakeholders, including salvage yards, consulting firms, sustainability experts, and academic institutions, each contributing their specialized knowledge and resources. These collaborations span from grassroots community organizations to high-level industry consortia, reflecting a commitment to shared CE goals. They include partnerships with technology providers to refine platform infrastructures, joint ventures with construction and demolition firms to optimize material reuse, and connections with policy entities to shape sustainable practices. Collectively, these alliances embody a concerted effort to integrate circular principles into mainstream construction processes.

4. Conceptual Framework and Discussion

The content analysis in the realm of circular construction and material exchange platforms highlights the necessity of customizing engagement strategies to the context and needs of diverse set of stakeholders. These findings resonate with prior research on stakeholder engagement in sustainable CE (e.g., Kujala et al., 2023; Re & Magnani, 2023). Based on insights outlined in the previous sections, the research team developed a conceptual framework focused on stakeholder engagement in the circular construction and material exchange sector (see Figure 2). The framework is based on series of stages that reflect the evolution and deepening of relationships between platforms and their stakeholders. These stages reflect the platforms lifecycle—from inception and community formation to growth and systemic impact—mapped against the types and levels of stakeholder engagement revealed by the data.

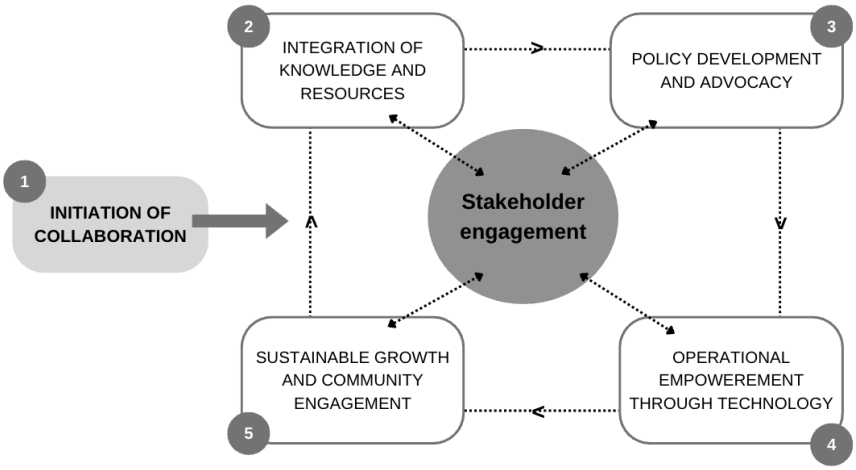

Figure 2: Conceptual framework for platform development

The stages of this framework mirror the lifecycle of platforms from their inception through to their systemic impacts, aligning with the lifecycle patterns and stakeholder engagement levels identified through our data analysis. This framework is deeply informed by the broader CE principles discussed in the literature review, including the shift from a linear to a circular model as advocated by thinkers like Hieminga (2015) and the varied interpretations and applications within the construction sector as examined by Kirchherr et al., 2017, and Adams et al., 2017.

- Initiation of collaboration: at this foundational stage, platforms establish trust with key stakeholders such as salvage yards and sustainability firms, which is critical as highlighted by Hart et al. (2019), who

note the importance of trust in fostering strong and cohesive partnerships. This stage involves setting up codes of conduct and community forums, essential for supporting future sustainable practices as seen in models discussed by Adams et al. (2017).

- Integration of knowledge and resources: this stage leverages educational content and training to enhance stakeholder capacity, akin to the approaches of platforms like BuildReuse. It reflects the necessity for continual resource use and minimal waste generation in CE, a concept outlined by the European Commission (2020).
- Policy development and advocacy: engaging with policymakers and influencers to shape the regulatory landscape marks a mature phase of engagement, aiming to effect systemic change—a strategy aligned with the top-down approaches discussed by Munaro & Tavares (2023).
- Operational empowerment through technology: utilizing technology to make participation in circular practices more efficient and scalable connects directly to the role of ICT as an enabler for CE as identified by Wilts & Berg (2018). Platforms enhance functionality through partnerships with technology providers, a crucial element for integrating recyclability in product design and reducing transaction costs.
- Sustainable growth and community engagement: this final stage involves expanding reach through strategic partnerships and fostering a community ethos, driving collective action toward sustainability goals. This stage embodies the bottom-up initiatives and the community-driven approach to CE transition discussed by Charef (2022) and Rodrigo (2024).

The theoretical implications of this framework highlight the essential nature of stakeholder engagement in driving the CE transition, particularly in the construction sector, where complexity and fragmentation often slow progress. Practically, this framework serves as a guide for digital platforms aiming to facilitate CE, providing a structured approach to stakeholder engagement that is vital for overcoming the barriers identified in the literature review. By addressing these, the framework contributes to closing the significant knowledge and practice gaps in the sector. More specifically, the proposed conceptual framework paves the way for the Lithuanian Construction Materials Reuse Optimization (LSEPO) platform, which aspires to become an example of social innovation and environmental responsibility, leading the civil engineering sector in Lithuania and the region towards a more sustainable and circular future. The emphasis is on cultivating an inclusive community from the start, as this underpins stakeholder buy-in and ensures the platform resonates with its user base.

5. Conclusions

This paper has offered a first look into the intricate dynamics of stakeholder engagement on circular construction and material exchange platforms. The findings highlight the diversity of engagement approaches, stressing the importance of customizing strategies to stakeholders' varying needs and contexts. This customization is paramount, as it ensures that platforms do not just exist as mere transactional hubs but evolve into ecosystems where knowledge, resources, and collaborative endeavors flourish. The research underscores the roles that different stakeholders play in this ecosystem, from material suppliers to policymakers, and from grassroots participants to corporate entities, all contributing to a shared vision of circularity and sustainability.

The paper proposes an actionable framework that delineates the evolving stages of stakeholder involvement, from the initial building of trust to the establishment of robust communities aimed at driving sustainable growth. This framework, distilled from a thorough content analysis, serves as a guiding instrument for the strategic development of platforms like LSEPO, paving the way for their adoption and impact within the circular construction landscape. By leveraging this framework, future platforms can harness the full potential of digital technologies to foster the principles of the CE in the construction sector. It invites future exploration into the functions and operations of such platforms, calling for a deeper understanding of how digital engagement can catalyze industry-wide change. Ultimately, this research serves as a stepping stone towards more comprehensive investigations that aim to bridge the current gaps in the literature and provide practical solutions for advancing sustainable practices within the construction industry.

This paper calls for future research to delve deeper into the operationalization of these functions and to explore the dynamic interplay between various stakeholders. Strategic partnerships, as showcased by the platforms, are pivotal for expanding capabilities and advancing CE principles. The research underscores the significance of these partnerships in fostering innovation, sustainability, and community engagement, ultimately contributing to a more resilient and circular construction industry.

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