Perspective

The Circular Economy in the Construction Industry: From Research to Practice

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Abstract

The transition to the circular economy (CE) in the construction industry requires a shift from conventional researcher's roles and thinking styles. The shift is crucial for an industry, which is known for its massive waste generation and resource use globally. The need for collaboration skills cannot be over-emphasized since many CE initiatives involve several stakeholders with diverse interests and approaches to problem solving. It is crucial that CE researchers contribute to the development of theories that are relevant to social issues as well as science in order to enable real-world societal changes and to fast-track the transition to a circular construction sector.

Keywords: Circular Economy, Construction Industry, Practice, Research, Social Change, Theory

The circular economy (CE) represents a transformation from linear models of consumption and product disposal to more sustainable and renewable models based on re-use, repair, restoration and recycling of materials and products (Fogarassy & Finger 2020). Such a shift is of paramount importance for the construction industry, which is accountable for significant amounts of waste and resource consumption globally. For instance, the construction industry accounts for around 40% of global energy consumption, 30% of energy-related greenhouse gas emissions, and 40% of raw material consumption (Akanbi et al., 2018). These data highlight the dire need for more sustainable construction practices, making it a suitable option for CE implementation. CE researchers play a role in effecting this transition since, less obviously, they are part of a social process that contributes to researched social change in the real world (Salvioni & Almici, 2020), and it is this aspect of their work that is at the forefront of discussions about the role of CE researchers in construction. Ongoing debates persist regarding whether research is needed, based on vested interests, relations between those who do the science and those who use it, and how to educate researchers to be theoreticians as well as advocates of social values. However, beyond the theoretical realm, there are certain skills that a researcher must possess. The purpose of this paper is to provide practical and valuable insights that can assist researchers in efficiently implementing the CE principles.

Researchers in the field of CE need soft skills to be able to influence real social changes. First and foremost, the need for highly developed communication and collaboration skills originates from the research output: transposing monumental insights from complex research into 'products' that construction industry stakeholders, policymakers and the public can use (Brown et al., 2021). Building upon this, the need for collaboration skills is a matter of scale: many CE initiatives involve multiple stakeholders with varying interests and different ways of solving problems. Consequently, adept coordination and negotiation abilities are required to reconcile the disparate perspectives and forge consensus towards mutually beneficial solutions. Context-awareness is another soft skill CE researchers need, in order to cut their way through the web of socio-economic and political context framing the CE research (Ekins et al., 2019). Being able to structure the complexity of real problems beyond technical boundaries and formulate solutions that are not only technically sound but also socially and economically viable, presents an enormous challenge that hinges

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on an open and adaptable mindset for researchers. Beyond these skills, CE researchers also need entrepreneurial spirit and problem-solving skills. This includes identifying places of entrepreneurial opportunities, developing practical solutions and having the challenge of facing concrete, robust frameworks within which to ultimately translate the CE principles to the construction industry.

Traditional research approaches often constrain researchers to theoretical domains, preventing them from engaging with stakeholders and fostering meaningful dialogues and collaborations. Nevertheless, researchers in the domain of CE are required to actively involve themselves in tangible discussions and decision-making procedures to ensure the implementation of their findings. Brown et al. (2021) emphasised that forming collaborative alliances with industry stakeholders, such as construction firms, material suppliers, and waste management companies, proves to be a fruitful approach. It is critical to acknowledge the considerable advances that have already been made in this area. Researchers and industry professionals have collaborated to create and execute CE strategies in construction projects globally. For example, the European Union's Horizon 2020 research and innovation initiative has funded a number of projects that bring together researchers and industry partners to advance CE practices in construction. Buildings as Material Banks (BAMB) is one of such projects, with 15 partners from seven European countries, including universities, research institutes, and industry stakeholders (Debacker et al., 2017). The project developed and tested methods for designing buildings with reversible components to facilitate future disassembly and reuse. Another example is London’s Circular Building, a collaboration between Arup, Frener & Reifer, BAM, and The Built Environment Trust. The project demonstrated how modular design and construction techniques may be used to facilitate disassembly and material reuse. According to Adams et al. (2017), the building serves as a model for integrating CE principles into urban construction.

By engaging in these partnerships, CE researchers can acquire firsthand insights into the difficulties and limitations encountered by professionals, enabling them to formulate and execute more pertinent and influential research studies. Moreover, CE researchers should actively participate in industry forums, conferences, seminars, and workshops to disseminate their findings, exchange ideas, and co-create solutions with practitioners (RREUSE, 2023). Researchers can better understand the complexities of real-world challenges by immersing themselves in construction environments and experiencing the constraints and nuances for themselves. Consequently, they can tailor their research questions and methodologies to better address these complex realities. The construction industry's transition to circular economy principles has been greatly supported by collaborative efforts between academia and industry. Several initiatives and collaborations have been formed to promote sustainable construction practices. For instance, the Ellen MacArthur Foundation has played a key role in developing industry-academic collaborations aimed at incorporating CE principles into construction (Ellen MacArthur Foundation, 2019). Furthermore, research institutes such as TU Delft have partnered with industry stakeholders to create novel circular construction solutions (Leising et al., 2018).

Circular economy projects involve a variety of stakeholders with different interests, which can lead to disputes and tensions (Padilla-Rivera et al., 2020). CE researchers, as impartial and objective observers, are well-positioned to navigate these competing interests and foster constructive dialogue. CE researchers may objectively examine the effects of various CE strategies and present their findings in a transparent manner, allowing stakeholders to make informed decisions while balancing competing interests. Furthermore, CE researchers have the capacity to function as mediators by creating transparent communication channels and platforms for involving stakeholders (Greene et al., 2024). This responsibility can be fulfilled by maintaining a neutral stance and conducting a comprehensive analysis of relevant issues. In addition, by stimulating productive dialogue and promoting common understanding, researchers can help stakeholders to recognise their mutual interests and formulate collaborative solutions for their respective issues.

Historically, there has been a division between researchers and practitioners, and the former is often perceived as passive observers rather than active participants in practical projects (Zavos, 2024). Nevertheless, within the CE domain, this disparity could hinder the successful transfer of research outcomes into tangible implementations, especially in construction projects. To address this disparity, CE scholars must proactively involve practitioners and cooperate on practical projects. Collaborating with industry experts enables scholars to enhance their grasp of real-world obstacles and limitations, while also contributing theoretical expertise and analytical capabilities (Sumter et al., 2021). This collaborative method helps to

scale the application and relevance of research findings, promoting the cyclical flow of knowledge and information. In other words, practitioners may benefit from researchers' academic skills and distinctive viewpoints, which helps to base their research inquiries in empirical observations and offer them with useful, hands-on information derived from real-world context.

The development of researchers in the field of CE who can contribute to both theoretical frameworks and societal principles necessitates a multidisciplinary strategy. Educational institutions play a crucial role in shaping the next generation of CE researchers by integrating hands-on and practical learning experiences into their academic programs (Enel Américas, 2022). Specifically, cross-disciplinary initiatives that merge technical expertise with research in social sciences, economics, and politics can equip CE researchers with a holistic understanding of the intricate issues and stakeholder interactions linked to the CE transformation. Practical training, partnerships with industries, and analysis of real-life cases all offer vital experiential learning opportunities and a platform for addressing authentic challenges. Furthermore, research funding and industry partnership should contribute to the promotion of academics to work together with practitioners in research projects as recommended by Meseguer-Sánchez et al. (2021). This, in turn, encourages the cooperation between research communities and practitioners to provide researchers with real world data and insights and practitioners with the latest research findings and innovative solutions. Ultimately, professional growth opportunities such as workshops, mentoring programmes, and knowledge exchange platforms play an important role in promoting continuous learning and dissemination of knowledge between CE researchers and practitioners (Andersson et al., 2023). These efforts contribute to the establishment of a collaborative environment that allows researchers to stay informed of industry trends and obstacles, while at the same time providing their expertise to promote social progress.

On a brighter note, the construction industry has begun integrating CE principles across different stages of the building lifecycle, from design and material selection to construction, usage, and end-of-life phases. This holistic approach not only enhances sustainability, but it also has economic and environmental benefits. For instance, designing buildings for disassembly entails creating structures that are readily deconstructed at the end of their life cycle, allowing materials and components to be reused or repurposed. This approach minimises waste and the need for virgin materials. The Brummen Town Hall in the Netherlands is an excellent example of disassembly by design since it was designed with a materials passport that documented each material’s potential for future reuse (Bakker et al., 2017). Similarly, the materials used in construction projects have a significant impact on their sustainability. Using recycled or sustainably sourced materials can significantly reduce a building's environmental impact. Projects like Park 20|20 in Amsterdam utilise materials selected for their recyclability and low environmental impact, demonstrating how careful material selection supports CE principles (Rahla, et al. 2020).

Innovative construction techniques, like modular construction, can facilitate the adoption of CE principles. This technology enables the production of prefabricated units that can be easily assembled, disassembled, and reused. This method minimises construction waste while simultaneously increasing efficiency and flexibility. CE principles can be used throughout the operational phase of buildings, not just during construction. Predictive maintenance, energy efficiency measures, and adaptive space utilisation are some strategies that can increase a building’s longevity and sustainability. Likewise, buildings may run more effectively while reducing their environmental impact over time by incorporating smart technologies and sustainable practices (Leising et al., 2018). When a building reaches the end of its lifecycle, CE principles advocate for structural deconstruction and material reuse or recycling. This approach reduces waste and encourages the development of a circular supply chain. Effective end-of-life management necessitates thorough planning and the use of techniques such as selective disassembly and recycling, which have been successfully used in projects such as Denmark’s Iceberg Towers (Pomponi & Moncaster, 2017).

The transition to a circular economy in the construction industry requires a paradigm shift in CE researchers’ roles and approaches. CE researchers may bridge the gap between theory and practice by cultivating essential skills, engaging in practical discussions and collaborations, overcoming conflicting interests, and bridging the gap between outside researchers and inside practitioners. Ultimately, developing CE researchers who can contribute to both theoretical and social principles is crucial for driving real-world social change and accelerating the transition to a more sustainable circular construction industry.

AUTHOR CONTRIBUTIONS

Olabode Ogunmakinde: conceptualisation, methodology, data collection, writing – original draft, review & editing, and supervision.

DECLARATIONS

Competing interests The author declares no competing interests.

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