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A Preliminary Review of Service Design for Repair Practices

Viktoria Yuliyeva Apostolova [(a)], Luca Simeone[(b)], Linda Nhu Laursen [(b)]
a) Aalborg University, Copenhagen, Denmark
b) Department of Architecture, Design and Media Technology, Aalborg University, Aalborg, Denmark

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Abstract: Repair remains an underutilised strategy in the circular economy, often deprioritised in favor of recycling despite its potential to reduce environmental impact and extend product lifespans (Keulemans et al., 2023). This systematic literature review investigates how service design can be leveraged to strengthen repair practices. By analysing 60 studies, three key levels of intervention emerge: (1) the micro level, where service design can influence consumer engagement, producer-user interactions, and repair motivations; (2) the meso level, focusing on tools, digital platforms, and process frameworks that facilitate repair accessibility and efficiency; and (3) the macro level, where service design has the potential to shape regulatory frameworks, business models, and cultural shifts that embed repair as a societal norm. Despite its potential, repair is hindered by challenges, such as product complexity (Owen et al., 2024) and insufficient legislative support (Cole & Gnanapragasam, 2017). This review highlights the role of service design in overcoming these barriers by fostering co-creation, developing repair-focused services, and integrating repair into broader sustainability initiatives (Rubenis, 2023). By positioning repair as a service rather than an afterthought, service design could offer new possibilities for circularity and resource efficiency.

Introduction

As the global push for sustainability intensifies, the role of design in supporting circular economy processes has gained significant scholarly attention (van Dam et al., 2020). Traditional linear production and consumption models, based on rapid resource extraction and disposal, are increasingly seen as unsustainable. To address this, researchers propose strategies, such as repair, reuse, remanufacturing, and recycling to extend product life cycles and enhance resource efficiency (Mrad et al., 2025; Frahm et al., 2024; Bakker et al., 2014). Among these strategies, repair remains underexplored and underutilised compared to recycling, which is often prioritised despite its high energy demands and material degradation (Keulemans et al., 2023). By contrast, repair offers a more sustainable alternative with a lower environmental footprint, making its integration into circular economy models increasingly critical (Keulemans et al., 2023).

Repair not only extends product longevity and reduces waste but also functions as a social practice, fostering knowledge exchange, skill development, and community engagement. The growing popularity of initiatives such as repair cafés highlights the importance of repair beyond its environmental benefits, positioning it as a practice embedded in social and educational contexts (van der Velden, 2021). However, despite its advantages, repair is often hindered by various challenges, including product complexity, planned obsolescence, and a lack of consumer awareness and education (Kalantidou et al., 2023; Owen et al., 2024; Abdelmeguid et al., 2024). Addressing these barriers requires a more holistic approach that considers repair not only as a technical activity but as an integral part of economic, environmental, and social systems (Rubenis, 2023).

While much research has focused on circular product design, service design is emerging as a crucial tool for enabling repair practices. Traditionally, service design has been concerned with optimising user experiences and improving service efficiency (Penin, 2018; Polaine et al., 2013). More recently, however, its scope has expanded to include broader systemic interventions, such as shaping business models, policy frameworks, and community-driven initiatives (Van Dam et al., 2020). By facilitating multi-stakeholder collaboration and co-creation, service design can play a key role in making repair more

accessible, economically viable, and socially embedded.

This paper aims to bridge the gap in research on how service design can support repair by conducting a systematic literature review of 60 studies. Our findings reveal three key levels at which service design can enhance repair practices: (1) the micro level, focusing on interactions between producers, products, and users; (2) the meso level, addressing tools, frameworks, and platforms that facilitate repair; and (3) the macro level, examining services that drive broader systemic transitions toward repair-centred business and policy models. By exploring these levels, we contribute to the growing discourse on the role of service design in enabling sustainable and circular practices.

Methodology

Our systematic literature review followed PRISMA guidelines (Liberati et al., 2009; Pati & Lorusso, 2018) to ensure a structured and thorough analysis. Using Scopus and Web of Science, we refined our keyword search to focus on repair practices, service design, and the circular economy. An initial search produced 105 papers. After removing duplicates, screening titles and abstracts, and assessing full-text eligibility, 43 relevant papers remained. Through snowballing, an additional 17 articles were identified, leading to a final selection of 60 studies. This approach ensured comprehensive coverage of existing research while capturing key developments in service design for repair practices.

Findings

This review explores the factors influencing repair culture across different levels - micro (consumer behavior), meso (business and industry practices), and macro (policy and systemic frameworks). By analysing the interplay between individual choices, corporate strategies, and regulatory structures, it highlights the key barriers and opportunities for fostering a sustainable repair ecosystem.

Micro Level

Consumer behavior significantly influences sustainable practices, including repair, as it determines how individuals interact with products and services (Munten & Vanhamme, 2023; Van Dam et al., 2020; Zimmermann et al., 2024). Consumers' choices directly impact companies' strategies by shaping demand for sustainable products (Zimmermann et al., 2024). However, Van Dam et al. (2020) argue that designing for repair alone is insufficient, consumers must also be motivated to care for and maintain their products.

A growing body of research explores barriers and motivations for repair from the user perspective. Factors such as emotional attachment, trust in repair services, product category, and customer confidence influence repair culture (Zimmermann et al., 2024). Consumers' decisions are shaped by intrinsic and extrinsic motivations, particularly in sectors like electronics, fashion, and household appliances (Zimmermann et al., 2024). Financial and environmental benefits can either encourage or discourage repair, depending on how they are communicated (Abdelmeguid et al., 2024; Zimmermann et al., 2024; Rudolf et al., 2022; Fachbach et al., 2022). Persuasive communication, including transparent brand messaging, is essential to building consumer trust and fostering repair engagement (Abdelmeguid et al., 2024; Munten & Vanhamme, 2023; Mrad et al., 2025).

Beyond fixing objects, repair services should highlight the symbolic, economic, and functional value of products (Godfrey & Price, 2023; Ackermann et al., 2018). Strategies such as storytelling, product demonstrations, and success stories help communicate this value (Abdelmeguid et al., 2024). Clear and empathetic communication about repair challenges increases consumer satisfaction and trust, whereas poor customer service and unsuccessful repairs discourage further engagement (Godfrey & Price, 2023; Mrad et al., 2025). Engaging consumers in repair workshops fosters material care and emotional attachment (Abdelmeguid et al., 2024). Nostalgia is a key driver for repair among both consumers and volunteers, influencing brand perception and consumer loyalty (Munten & Vanhamme, 2023; Owen et al., 2024; Nielsen & Laursen, 2023). Positive past repair experiences also increase the likelihood of future repair behavior (Fachbach et al., 2022). Perceived product quality affects whether consumers choose to repair or discard items (Maestri & Wakkary, 2011; Nielsen & Laursen, 2023; Munten & Vanhamme, 2023; Roskladka et al., 2023; Jaeger-Erben et al., 2021). Consumers are more likely to repair high-value

items or those with significant monetary investment (Zimmermann et al., 2024; Masclet et al., 2023; Ackermann et al., 2018). In contrast, cheaper products are often discarded, even in volunteer repair cafés (Nielsen & Laursen, 2023). However, fashion consumers present an exception- despite the overconsumption linked to fashion trends, some consumers repair fast-fashion garments due to emotional attachment (McNeill et al., 2020). Encouraging long-term emotional connections with clothing rather than trend-driven consumption could promote repair culture.

Consumers engaged in recycling are more inclined to repair (McNeill et al., 2020), yet repair remains overshadowed by recycling. Increasing consumer awareness about repair's benefits is crucial, as lack of knowledge and transparency serve as barriers (Abdelmeguid et al., 2024; Rudolf et al., 2022; Munten & Vanhamme, 2023; Luukkonen & Van Den Broek, 2024; Godfrey et al., 2022). Simple product designs and flexible materials encourage repair, while complexity discourages it (Lundberg et al., 2024; Godfrey et al., 2022). When repair information is unclear or unavailable, consumers are less likely to attempt it (Fachbach et al., 2022; Miles, 2019). Social acceptance and community engagement also shape repair behavior (Zimmermann et al., 2024; McNeill et al., 2020; Ackermann et al., 2018). Volunteers in repair cafés are often driven by emotional connections to repair (Nielsen & Laursen, 2023). While repair cafés promote anti-consumerism and community building, their financial accessibility remains limited, often attracting those who can afford repair and are ideologically aligned with sustainability (Masclet et al., 2023). Addressing financial and psychological barriers through persuasive communication and economic incentives can enhance repair engagement (Zimmermann et al., 2024; McNeill et al., 2020). Repair fosters creativity by encouraging stakeholder collaboration, user-centric approaches, and repurposing objects (Abdelmeguid et al., 2024; Maestri & Wakkary, 2011). However, electronic waste is growing rapidly due to increasing product complexity and limited repairability, leading to "hibernation" where unused electronics accumulate without being discarded or repaired (Owen et al., 2024; Moreu & Hurtado, 2023; Zimmermann et al., 2024; Kalantidou et al., 2023).

Meso Level

Repair, once a standard practice, is now being re-examined as a critical component of sustainable design and innovation (Rosner et al., 2013; Mejer et al., 2010). Key themes in repairability include consumer engagement, user-centered design, cost and service efficiency, strategic planning, and circular economy approaches. By understanding these aspects, companies and consumers alike can foster more effective and sustainable repair practices.

Interactive platforms, workshops, and clear communication strategies encourage users to engage in repair (Ackermann, 2021). The repair literature, especially in electronics, emphasises challenges posed by technological complexity. Strategies such as push notifications, product modifications signaling the need for repair, and knowledge-sharing platforms help raise consumer awareness (Ackermann, 2021; Lechner et al., 2024). Social engagement, through repair events and collaborative platforms, fosters shared ownership and long-term product care (Ackermann, 2021). Offering repair toolkits and allowing personalisation also enhances consumer involvement (Rosner et al., 2013).

User participation in product design ensures alignment with repairability goals (Mellick Lopes & Gill, 2023). Furthermore, technology enhances transparency, customisation, and service efficiency, with seamless value chain collaboration being key to sustainability (Abdelmeguid et al., 2024). Companies can partner with disassembly-ready manufacturers to enhance circularity. However, transitioning from product sales to service-based models presents challenges, including high labor costs and revenue constraints (Neely, 2008). Resistance from sales teams, customers, and corporate culture remains an obstacle.

Repair services must balance cost and speed to maintain competitiveness. A bi-objective model minimises delays and costs in post-sales repair networks (Yıldız & Soylu, 2019). Financial incentives, such as tax reductions, cash refunds, or repair vouchers, could further encourage repair (Rudolf et al., 2022). Competition between manufacturers and third-party repair services necessitates mathematical optimisation for cost-efficiency and repairability (Sabbaghi & Behdad, 2017). Improving design manuals with better graphics and terminology

enhances efficiency, safety, and customer satisfaction (Nelson & Adams, 1988).

Poor planning of repair centre locations and resource allocation can increase costs and delays (Zhou et al., 2007). Location-allocation models optimise transportation and service coverage. Barriers in ship repair, including poor scheduling and lack of coordination, can be mitigated using web-based planning tools (Siswantoro et al., 2022). Algorithms further refine repair request management (Rossihina et al., 2020). Urban-rural disparities in repair accessibility highlight the need for solutions to bridge these gaps (Fachbach et al., 2022).

Providing standardised repair tools and accessible toolkits supports both consumers and repair professionals (Rudolf et al., 2022; Masclet et al., 2023). Multimedia resources, such as video tutorials, enhance accessibility (Kilic & Sailaja, 2024). Trust in repair services depends on experienced technicians, transparent pricing, and manufacturer support (Lechner et al., 2024). Many modern products are designed for recycling rather than repair, increasing complexity and costs (Masclet et al., 2023). Designing for disassembly reduces repair time and expenses (Miles, 2019). Updated tools and organised repair environments reflect professionalism and reliability (Godfrey & Price, 2023). Data management systems support 'Design for Repair' by providing stakeholders with technical insights (Roskladka et al., 2023).

Harvesting parts for reuse remains underutilised in service industries (Kodhelaj et al., 2019). Frameworks for part harvesting in high-value, regulation-intensive industries like medical equipment demonstrate scalability (Kodhelaj et al., 2019). Reverse logistics models optimise repair service costs and efficiency (Amini et al., 2005). Efficient maintenance in sectors like automotive and aerospace involves balancing costs, repair capacity, and inventory levels (Tursunovic, 2020; Rappold & Van Roo, 2009).

Mechanised diagnostic tools improve service efficiency, as seen in telecommunications repair networks (Dale et al., 1982; Leonard & Zielinski, 1982; Gauthier & Harris, 1982). The ReSOLVE framework incorporates renewable energy, modular design, virtual platforms, and 3D printing into corporate circular practices (Tu et al., 2020).

Thoughtfully designed repair touchpoints foster community involvement and education (Olivastri & Tagliasco, 2024). Hybrid spaces integrate repair stations, bookcrossing areas, and flexible furniture to encourage skill-sharing and social engagement. Elevating second-hand objects through branding reinforces sustainability and repair values.

Macro Level

Repair culture and sustainability demand more than minor adjustments between consumers and manufacturers; they require systemic transformations encompassing legal, infrastructural, and strategic support (Baines et al., 2009; Tukker & Tischner, 2006). Scholars emphasise the need for interdisciplinary insights from business, design, consumer behavior, and innovation studies to align financial and social priorities while embedding repairability into corporate strategies (Rubenis, 2023). This transition entails structural shifts in production and marketing, incorporating life-cycle assessments to evaluate economic, environmental, and social impacts (Mont, 2022). Expanding beyond eco-design towards circular economy models ensures that products and materials remain in use through repair, remanufacture, and recycling, positioning service design as a vital tool for empowering workers and prioritising consumer education (Wiseman & Sanderson, 2023).

Institutional and policy barriers continue to hinder repair accessibility, particularly in consumer electronics, where restrictive intellectual property laws and misleading warranties complicate user interventions (Svensson-Hoglund et al., 2021). Reforming regulations to mandate repair-friendly designs, extend warranty periods, and enhance consumer protections can shift corporate responsibility beyond profit motives, fostering an ethical business landscape (Rudolf et al., 2022; Abdelmeguid et al., 2024). However, challenges such as greenwashing remain prevalent, as companies often superficially align with sustainability without genuine commitment (Abdelmeguid et al., 2024). Strengthened legislation, transparency, and accountability measures are crucial in ensuring that repair becomes an integrated, rather than performative, aspect of corporate strategies (Mrad et al., 2025).

Beyond regulatory frameworks, repair challenges cultural narratives surrounding obsolescence and disposability, transforming imperfections into creative opportunities (Kalantidou et al., 2023). Repair is not merely a technical process but an act of care for objects, materials, and communities (Rubenis, 2023). Current consumption patterns often prioritise symbolic and emotional value over material appreciation, neglecting the integrity of resources (Godfrey & Price, 2023). Therefore, encouraging an ethos of repair - one grounded in empathy, responsibility, and material respect - can redefine consumer engagement. Businesses play a role in this by fostering repairable product guarantees, integrating repair services into their operations, and training employees to approach materials with sensitivity rather than disposability (Godfrey & Price, 2023). Recognising repair as a skill requiring adaptability and creativity can also drive innovation within repair systems and organisations (Godfrey & Price, 2023).

Socially, repair extends beyond individual objects, fostering community resilience and shared knowledge (Moreu & Hurtado, 2023). Recognising repair as a collective rather than an isolated act can empower individuals, particularly those in vulnerable communities, by creating spaces for engagement, education, and skill-building (Mellick Lopes & Gill, 2023). Local governments must support these initiatives, moving beyond consumer-centric models to recognise commoning practices as essential to circular economies (Kashyap et al., 2023). Repair hubs and collaborative spaces strengthen social ties, promote confidence, and challenge the structural forces driving rapid consumption (Kashyap et al., 2023). However, addressing repair at a systemic level necessitates confronting global supply chains, mass production cycles, and corporate pressures favouring low-cost, high-turnover models (Stein et al., 2023). Sustainable design must incorporate long-term resilience, shared ownership models, and extended producer responsibility to create repair ecosystems that are not only accessible but also equitable across economic and cultural contexts (Wiseman & Sanderson, 2023).

Conclusions

Repair culture is an essential component of sustainable consumption, yet it remains constrained by psychological, economic, and systemic barriers. Addressing these challenges requires a multifaceted approach that integrates user engagement, corporate responsibility, and policy interventions. Consumer trust, regulatory support, and corporate transparency are pivotal in shifting repair from a niche practice to a mainstream sustainability strategy. Strengthening education, community initiatives, and economic incentives can further enhance repair accessibility and appeal (Zimmermann et al., 2024). Ultimately, fostering a repair-oriented mindset across all levels - individual, corporate, and institutional - will be crucial in establishing a circular economy and reducing waste.

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