

Leveraging New Product Development Strategies to Drive Societal Well-being and Human Quality of Life: Insights from a Circular Economy Perspective



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Abstract

In the sustainability discourse, the concept of circular economy (CE) stands out as a shift from traditional production and consumption models. Traditional model follows a linear trajectory in which raw materials are extracted, products are manufactured, used, and then disposed of. Studies often focus on the environmental impacts of circularity, including waste reduction and resource conservation, with less emphasis put on how circular strategies can influence social outcomes. However, we argue that such a paradigm shift can also improve economic development, job creation, and societal well-being in addition to lessening the environmental impact of production systems through redesigning products and services. Compared to the economic and the environmental domain, the social domain of sustainability focuses on a wider range of aspects from social inclusion and labor practices to societal wellbeing. According to the strong sustainability view, the social domain plays an interlinking role between the environmental domain and the economic domain. All economic activities have a certain degree of impact on societal well-being. In the scope of business practices, societal marketing deals with organizations' potential contributions to societal well-being. Companies can have a direct impact on social sustainability through relationships with their employees and corporate social responsibility activities. Yet perhaps a larger impact could be achieved through the products and services they produce. In this manner, societal marketing can have a critical role to align new product development (NPD) processes and social sustainability goals.

Keywords: Product Development; Manufacturing Opportunities; Sustainability Potential; Resource Efficiency; Transformative Business Models.

JEL Classification: C88; D83; L81; M31; O15; O32

1. Introduction: New Product Development and the Social Aspects of Circular Economy

Responding to market demands and meeting consumers' needs can be companies' primary objectives for developing new products in traditional economies but, in circular ones, businesses are forced to ensure these products contribute to use longevity, reusability, and waste minimization. Aiming to make product development processes suitable to CE principles, strategies aim at designing products with a longer lifespan and enabling product longevity and repairability. Product design practices that support product and social sustainability, such as using recycled materials, local production, and ethical sourcing can directly enhance labor practices, improve consumers' access to sustainable products, and contribute to community development. Therefore, integrating circularity into product development processes minimizes their environmental footprint, contributes to social equity, and promotes inclusive growth.

Several circular design strategies are particularly emphasized for slowing resource loops. The first one is the design for disassembly. The CE centered product design process considers the reuse, recovery, or recycling of the parts of products at the end of the product lifecycle. Therefore, in CE, NPD strategies can aim to enable components and parts to be reused, recycled, or recovered for energy by simplifying disassembly. The second one is the design for recycling.

Efficient recycling needs appropriate product materials to be efficiently recovered and reprocessed when the product's lifespan ends. Enabling material separability and recyclability and using recyclable or recycled materials in NPD processes can be efficient practices for integrating the circular economy. Finally, other strategies (i.e., design for refurbishing and design for easy maintenance and repair) enable or simplify the repair and replacement of products' parts. In the NPD process, designers may aim to design products with standardized and modular components that simplify repairs. Additionally, providing detailed manuals that enable users' and repairers' maintenance and after-sale support for accessible spare parts improves further efficiency. All of these strategies can potentially decrease unemployment problems by generating local job opportunities for independent experts and skilled company workers with expertise in the maintenance and repair of products. Additionally, there will also be a need for skilled workers with expertise in recycling processes, such as disassembly, sorting, and material reclamation. Since maintenance and repair services are often provided near customers, such businesses are typically established locally, supporting local job creation, particularly in areas where manufacturing opportunities may be limited.

2. Strategies and Business Models for Equitable Design and Consumption

Along with increasing discrimination and vulnerability issues, inclusiveness has become a critical and integral aspect of NPD in recent years. Inclusive design aims to offer products, services, and experiences that are accessible, effective, and emotionally positive for the widest range of people, regardless of their abilities, or circumstances. In the early stages of product development, engaging with diverse users helps identify barriers and opportunities for inclusiveness. Inclusive design aims to create equal and fair opportunities that enhance the quality of life for the greatest number of people, considering both psychological and social factors.

In addition to the traditional market-oriented view that focuses on designing products and services to meet targeted users' needs, in CE, contributing diversity through increasing products and services' accessibility and affordability by broader and diverse groups of people has become a central tenet for NPD. *In recent decades, sharing, collaborative, and access-based consumption practices and using peer-to-peer platforms have become more widespread in consumption life, providing a suitable background for circular business models. By supporting these practices, businesses can make their sustainability-oriented products more accessible to diverse consumer segments, who usually cannot afford to own them.*

Product labeling, including the use of eco-labels, can significantly enhance consumer awareness about sustainability. Product labeling schemes, especially third-party certified labels, provide credible information about a product's green credentials, reducing the effort required for consumers to evaluate sustainability. Such information is often communicated through product packages, advertisements and websites. Eco-labels guide

consumers toward environmentally friendly choices by highlighting attributes like reusability, reparability, and recyclability, making them an effective tool for promoting sustainable behavior.

The design for longevity is an approach that influences replacement decisions through product design, which includes strategies such as designing for reliability and robustness; design for repair and maintenance; design for upgradability; design for product attachment; and design for variability. We argue that product life extension contributes to a sense of belonging by encouraging local repairs and maintaining products in local communities. People socialize around repair activities, such as repair cafés, which might strengthen local cultures and a sense of belonging, thereby boosting well-being. Unlike commercial repair, community repair emphasizes fostering a sense of community by addressing consumerism, promoting sustainability, encouraging collective learning, and sharing. Whereas enhanced durability extends product lifetimes and increases the likelihood of repair, many products are neither durable enough for long-term use nor repairable enough to address breakdowns.

The concept of CE emphasizes eliminating waste and pollution by avoiding hazardous materials and substances that could harm people or the environment. During the NPD process, choosing materials that are non-toxic and safe for human contact (for instance, toys made of BPA-free plastics, electronics without toxic heavy metals, textiles free from harmful dyes) enhances customer health and safety. Research into alternative, renewable materials align with circular principles. Material innovations, such as plant-based bioplastics, reduce reliance on harmful synthetic materials, ensuring products are safe for customer use and disposal. Additionally, considering the end-of-life phase, for instance designing packaging that decomposes safely or electronics that can be disassembled without exposing users to toxic substances, also promotes customer safety. Reusing materials can pose risks if workers are exposed to hazardous substances or unsafe conditions during recycling processes. By ensuring ethical standards from raw material extraction to the final product, sustainable NPD prioritizes non-toxic, renewable, and easily recyclable materials, not only for customers but also for workers' exposure to hazardous substances during manufacturing and disposal. Thus, ethical sourcing may also enhance safe labor standards, elevating occupational health, and safety in global supply chains.

3. Investigating Societal Impact with an R Hierarchy Lens

As a widely acknowledged framework in CE literature, the waste hierarchy organizes circular strategies based on their sustainability potential and impact on resource efficiency. The strategies involved in the hierarchy are often referred to as a ladder, where each “R” signifies an action (Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, and Recover) prioritized by their capacity to preserve resources and mitigate environmental harm. As seen in Figure no.1, higher-tier actions result in shorter resource loops while lower-tier strategies offer limited prevention of waste generation and longer resource loops.

3.1. Designing Shorter Loops at Conceptualization Phase: Refuse, Rethink, and Reduce

The refuse strategy advocates rejecting unnecessary components, compounds, products, or services, emphasizing minimal resource use at the conceptualization phase in NPD processes. Thus, products must undergo an assessment to evaluate the direct or indirect environmental impacts of all the materials used in their production. The elimination of harmful materials or their replacement with more sustainable alternatives can

lead to substantial changes in product design. These changes may even result in modifications to the product’s functionality or form. The rethink strategy stresses radically reimagining how products and services can meet user needs with fewer resources or innovative approaches in order to cause lower environmental and social impact. In this sense, compared to other concepts of R-hierarchy, rethink is a vague and broad strategy that is hard to illustrate with solid suggestions for implementation in NPD. Incorporating rethink into NPD often results in transformative business models. For instance, the adoption of product service systems, where the functions traditionally fulfilled by physical products are instead provided through more intangible solutions, such as services, may also drive significant improvements in sustainability. Compared to the dramatic changes offered by refuse and rethink, the reduce strategy aims to minimize resource input and waste generation during product life cycles. In NPD, this can involve material substitution, lightweight design, energy-efficient manufacturing processes, or designing products that use less energy and complementary products during the use phase. For instance, designing bottles in a way that reduces the amount of plastic raw material used in production for each product would not only decrease the material use and extraction but also cause less fuel consumption during the transportation of goods to market and waste to recycle facilities. Socially, the reduce strategy aligns with affordability by lowering use phase costs for end-users. Notable examples include the development of energy-efficient appliances that consume fewer resources throughout their lifespan, water-saving washing machines consuming less detergent targeting low-income consumers.

3.2. Extending Product Lifespan in Use Phase: Reuse, Repair, Refurbish, Remanufacture, and Repurpose

Offering relatively longer resource loops compared to the previous three strategies, the reuse emphasizes extending the life of products by encouraging repeated utilization in their original form. NPD can facilitate

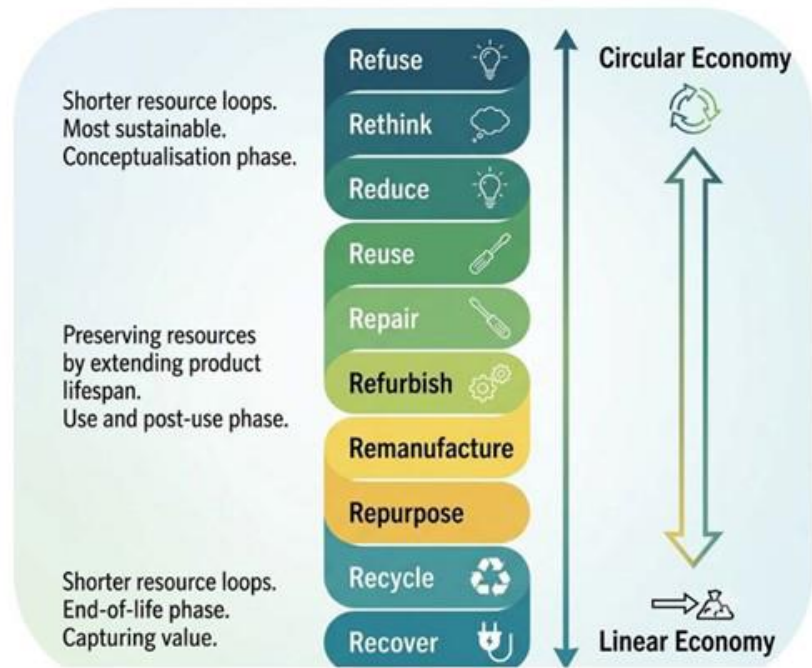


Figure no.1 - R-Hierarchy

Source: Kirchherr, J., Reike, D., & Hekkert, M. (2017). "Conceptualizing the circular economy: An analysis of 114 definitions. Resources, Conservation and Recycling" (work cited)

reuse through designing durable, repairable, and aesthetically timeless products while enabling business models like renting or leasing to enable product reuse. Contrary to packaging and many other single-use products, the majority of the goods have lifespan allowing them for multiple use scenarios. While the level of multiple use changes according to the durability, cost and use case of the product, commercial initiatives develop strategies to keep products in cycle. For instance, furniture, as a product category having relatively longer lifespan, has potentials for manufacturer buy-back and resell programs. This approach provides cheaper second-hand alternatives to consumers and also decreases furniture waste. In addition to manufacturer companies, in some cases, initiatives provide lacking logistics and technology as a resell channel. Thus, smaller companies are facilitated to access the secondary market with minimal investment. In addition to a reduced amount of waste, the reuse strategy can promote consumer awareness of sustainable practices, fosters behavior change. Moreover, in second-hand markets, items often cost significantly less than the original goods, which could improve affordability and thus contribute to social inclusion.

The repair strategy includes restoring functional states of the faulty products and preventing premature disposal. Socially, enhancing repairability as a strategy can (i) contribute to skill development and job opportunities in the repair sector, (ii) improve collaboration and social networks in communities, and (iii) foster a value co-creation process by enhancing consumers' DIY repair capabilities. Refurbishment aims at restoring products to like-new conditions for resale or extended use. In NPD, this strategy encourages the integration of refurbishment loops into supply chains, as seen in companies like Apple's certified refurbished devices. Socially, refurbishing goods supports affordability by providing high-quality products at reduced costs. This is particularly beneficial in low-income regions where access to new products is rather limited. Enabling refurbishment opportunities for some products is crucial, including electronics, since informal waste processing often causes environmental and health problems. Yet, refurbishment might not be appealing for the consumers as they might mistrust depending on the product category. Better understanding consumer attitude toward refurbished products, offering quality assurance mechanisms might reduce the negative stigma around refurbished goods.

The remanufacture strategy highlights utilizing components of used products to develop new ones performing similarly to the original. Companies should stress design and use of standardized components and reverse logistic flows in NPD processes to yield better from the remanufacture strategy. In an industrial ecosystem, reverse logistic systems especially if manufacturing facilities are geographically distributed, companies might benefit from establishing remanufacturing hubs which fosters regional economic development and employment. In some cases, remanufacturing disposed products to retain original performance might not be possible or cost effective. Yet, companies might yield material value through utilizing components by transforming them into completely new purposes. Repurposing categorically requires more energy and material for complex transformation processes. This strategy often requires further design and development processes, based on the availability of waste materials and components from different companies. Efficiency of material cycles to keep value by repurposing often depends on the complexity of the product. Products having simpler forms and detachable components are often more prone to retain value through the repurpose strategy. Repurposing shipping containers into affordable housing units is an effective example for this case. The strategy can be used in urban areas to address housing shortages or housing solutions in emergencies. Socially, the repurpose strategy addresses critical needs of underserved populations such as housing shortages and waste management in resource scarce settings. Furthermore, stakeholders of an industrial ecosystem working together to find new ways to utilize waste materials and energy available in the ecosystem, will foster sustainable product and process innovations reducing environmental impact, while increasing cooperation, mutual learning and collaboration among the ecosystem's stakeholders. However, challenges such as regulatory obstacles and limited material compatibility can limit scalability of such cooperation.

3.3. Capturing Value at the End-of-Life Phase: Recycle and Recover

Recycle focuses on processing waste materials into new products, reducing reliance on primary resources. As mentioned in the earlier section, promoting the recycling ecosystem may increase job opportunities in recycling industries. Additionally, fostering recycling strategies in NPD can also contribute to environmental health by

reducing waste, which eventually contributes to societal well-being. Adidas' use of ocean plastic in footwear production highlights how an environmentally problematic waste material can be used in a higher value product. However, its energy-intensive processes and potential for downcycling which require material quality degradation, pose challenges for achieving broader sustainability goals. Ensuring fair labor conditions in informal recycling sectors and investing in advanced recycling technologies can improve its societal outcomes. Recover refers to extracting energy or materials from waste, typically through incineration or chemical processes. In NPD, this strategy might require developing post use disintegration scenarios of the product and its components. In some cases, leftover materials of the manufacturing phase might be used for energy generation for the company. Recover is the least preferable strategy and causes the longer resource loops compared to other strategies mentioned in this section. In some cases, this approach reduces landfill dependency, supports waste valorization, reduces greenhouse gas emissions, and may provide cleaner fuel options—an alternative energy source—for communities, especially in areas lacking infrastructure. Perhaps the most effective application of the recovery strategy is the composting of organic waste, which can recover energy through anaerobic digestion. In this way, food waste can be used for electricity, heat generation, and nutrition for farming.

3.4. The Social Impacts of NPD Strategies within the Circular Economy Framework

As discussed in this article and summarized in Figure no.2, the connection between human well-being and ecosystem health implies that economic activities and decisions taken in the NPD not only depend on but also substantially impact societal well-being.



Figure no.2 - Social implications of NPD strategies within the framework of CE

Source: Mansilla-Obando, K., Jeldes-Delgado, F., & Guiñez-Cabrera, N. (2022). Circular economy strategies with social implications (work cited)

NPD strategies such as effectively communicating product and service labeling and certifications related to sustainability, enabling reuse, and repurposing scenarios during the use and end-of-life phases of the product lifecycle, and consciously refusing the use of certain materials and components in the conceptualization phase might improve public awareness and knowledge about sustainability and the CE.

Similarly, lowering the cost of products or services through the R strategies (Rethink, Reduce, Reuse, Refurbish, Repurpose, Recover) or developing access-based business models and PSSs might allow a wider range of consumers to benefit from these products and services. Ultimately, these strategies have the potential to enhance social inclusion.

Certain NPD strategies within the framework of CE could also contribute to creating job opportunities and fostering local development by fostering repair, remanufacturing, and recycling sectors. In addition to job

creation, increasing the repair and repurposing scenarios during NPD processes can help develop a sense of belonging and community among consumers. Additionally, to gain higher benefits from repurposing, a mutual learning process between companies within the same industrial ecosystem might be a beneficial approach. Among all, perhaps the most direct social impact in the domain of health, safety, and life quality can be achieved through eliminating harmful materials and considering ethical sourcing. These strategies can drastically improve the social impact of value proposition, while encouraging businesses to develop sustainability-oriented alliances along the supply chain.

4. Societal Marketing Implications and Conclusion

Adopting CE principles in NPD strategies creates market opportunities while requiring companies to rethink societal marketing. New organizational models must consider the circular and holistic interrelationships between production and consumption that not only need to respond to customer expectations but also promote societal well-being. In these circular systems, marketing practices are expected to support customers in understanding the importance of sustainability and embracing sustainable consumption behaviors. In product development decisions, product benefits like extending product lifespan, reusability, repairability, or modularity have regained their importance because of their role in alleviating resource depletion. Recent studies and real-world practices also support the idea that new business models can encourage and empower users to show more sustainable behaviors. For instance, sharing platforms can transform consumers' ownership-based product consumption habits to access-based circular consumption practices.

Repair systems also have the potential to raise consumer awareness and push them to prefer economically and environmentally responsible and sustainable choices. Besides aiming to enable sustainable features of their products, companies can form circular communities with the partnership of local actors including local associations and organizations, local businesses, social media forums, online, and offline social groups. These communities can transform product consumption practices into more sustainable and responsible directions. Besides, they also strengthen the social aspects through community development practices such as social activities and workshops, where consumers exchange knowledge and skills with others and support sustainable living. Consumers are interested in the design processes of products, and their evaluations of these products are influenced by the information they obtain about these processes.

Emphasizing how the product is designed for repairability (e.g., giving information about the modularity of the product with easily replaceable components) and highlighting the repair-friendliness of the design compared to competitors could be another strategy within this framework. Additionally, companies use certifications related to sustainability in their marketing (e.g., by placing the certification logo on their website or product packaging). However, studies show that eco-labels are often misunderstood and perceived as confusing and unreliable due to poor design, including insufficient information, lack of clarity, or ineffective imagery, which hinders consumers' ability to understand them, ultimately limiting their capacity to make environmentally responsible purchasing decisions. Thus, to use eco labeling as an effective behavior change tool, companies should provide information on their accomplishments to gather a certificate rather than simply displaying their logo to consumers who may not know enough about it. Equity and inclusivity considerations have become central to societal marketing strategies in CE. Therefore, along with other responsibilities, marketing strategies that adopt CE principles are responsible for (1) developing products that are accessible to diverse consumer segments and (2) making existing products accessible to more vulnerable consumer groups rather than only targeting privileged consumer segments.

In conclusion, the transition toward CE principles needs fundamental reconstruction of product development strategies and practices. In their NPD processes, organizations must move beyond targeting specific consumer segments and meeting their needs. They need to embrace more systemic, holistic, and collaborative marketing practices considering the circular relationships between production and consumption. We argue that these implications help companies to adapt their NPD strategies to CE principles, support consumers to show sustainable behaviors and construct long-term relationships between consumers and their products and contributing broader economic, societal, and environmental goals.

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