

Sustainable Value Chains: Integrating Business Model, Supply Chain, Product Development, And Data

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Abstract

The annual electronics waste production reaches 75 million tons by 2030, but the global recycling rate is currently only 17%. Several issues on advancing circularity practices for better reuse, repair, and recycling remain unsolved. Technical research (e.g., extractive metallurgy) is rich, but topics such as collection, tracing, and recycling chain optimisation are insufficiently addressed. Additionally, more research is needed on how data management and digitalisation can advance the Circular Economy (CE) of electronics. European Commission launched a new CE Action Plan in 2020 focusing on product policy, and in 2022, the regulation concerning eco-design was updated. Companies must, therefore, build new circular business models, products, and supply chains, which will increase the number of involved stakeholders and their requirements in the value chains. Although product design is a key obstacle to circularity, circular design concepts are currently immature. Challenges also exist in business and operational aspects, as well as in waste handling and processing. Furthermore, consumers have privacy and security concerns about recycling. Data management and digital solutions can address many of the previous challenges by improving information flows and material flow tracking. Data and digital services can also incentivise consumers, provide access to real-time lifecycle data, and enable designing sustainable products and business models. This paper presents a sustainable value chain framework focusing on the business model, supply chain, and product development aspects, as well as the role of data. This conceptual framework can be utilised by researchers and practitioners in developing more sustainable value chains for consumer electronics.

Keywords: business model, consumer electronics, circular economy, data, product development, supply chain, value chain