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Post-manufacturing Production – a Key Circular Economy Concept Towards Prolonged Product Lifetime.

R Carlsson & T Nevzorova, RISE Research Institutes of Sweden, Sweden

The linear economy of physical products is built up as a chain of linear industrial unit processes, where final product manufacturing crowns the top of the value chain at which the point of sales establishes the main return of investments and defines the profit for the value chain. After the point of sale, the use phase and its after-market of maintenance, service, and spare parts are support systems along the linear value chain towards the end of life. Applying a circular economy perspective suggests a shift from the supply chain operations to the effective, efficient, and commercial emphasis on the post-manufacturing production processes. This is key to transforming the linear economy into a circular economy that truly attracts businesses, financiers, and customers to make the shift. Moreover, there is a strong need for companies to get some help with designing the business model and the prolonged lifetime of the product while minimizing negative sustainability impacts and maintaining sufficient economic benefits both for customers and producers.

Our research introduces a generic life cycle assessment-based model developed to assess economic and sustainability performance for different circular business models emphasizing post-manufacturing production. The model is designed as a simulation tool during the development of business models for a prolonged lifetime as well as a tool to assess customer responses to information and incentive campaigns. This model also considers customers' and other actors' needs throughout the prolonged life cycle to get information at different points throughout the product life cycle. To make this possible the consumer needs to be aware of, informed about, or be incentivized to act on over the product's lifetime, the model includes these facts and has communication and behavioral change as variables. Therefore, the model includes the effectiveness of various types of information channels at different moments throughout the post-manufacturing prolonged lifetime, such as at the moment of purchase and during different stages of use, refurbishing, remanufacturing, dismantling, and recycling. Specific focus is to establish principles for effective indicators and data quality aspects in the relation between post-manufacturing and its production efficiency.

The practical case studies are performed together with Swedish companies that try out and run circular business models in consumer product sectors. Since the research aim is to make a general model that can be used as a guidance tool for circular products and business model designs for various types of consumer products, the participating companies represent different industries such as clothing, construction material, and small machinery.