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Integrating a Strategic Sustainable Development Perspective in Product-Service System Innovation

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Abstract
There is an intersection where society's social and ecological challenges coincide with the industrial firm's challenge to maintain profitability in a globalizing world. Products connect these challenges. The development of these products together with services (product-service systems) therefore provides a critical intervention point to address these challenges. This includes e.g. defining what the products and services are, how they will deliver value to users, and the business models that enable them to be realized, as well as how these can contribute to sustainable development of society.

The overarching goal of this research is to contribute to sustainable development of society by better understanding how a strategic sustainable development perspective based on backcasting from basic principles for a sustainable society can be brought into and guide product-service system innovation. Interviews with industry professionals, workshops with both manufacturing companies and within student projects, and industrial cases studies, together with a review of literature and theoretical considerations, provide the methodological basis for this work.

This thesis contributes to clarifying theoretical and practical possibilities and limitations for a strategic sustainable development perspective to guide product- service system innovation and provides a basis for the integration of these concepts. The findings indicate that the co-innovation of products and services in product-service systems can contribute to sustainable development of society both by supporting reduced material and energy use and by supporting improved life cycle management of materials. Further, a strategic sustainable development perspective can contribute to the refinement of existing tools and methods in product-service system innovation by providing an operational definition of sustainability articulated in the form of first-order principles that describe the boundary conditions for a sustainable society, and by providing guidelines for how to approach a vision of success inside those boundaries in a strategic way.

In order to identify solutions that meet society's pressing challenges, new solution spaces may need to be identified, and this can be enabled by a shift from product development with service as "add-ons" to their co-innovation in product-service systems. An initial approach for how this could be enabled through bringing together set-based approaches to design product-service systems with a strategic sustainable development perspective is presented.

Keywords
sustainable product innovation, sustainable product development, strategic sustainable development, product-service systems (PSS), life cycle management, set- based product development.