

## Abstract

This PhD thesis tackles a persistent operational paradox in design-based consumer goods industries: firms can carry excessive inventory while still losing sales through stockouts. This imbalance is driven by hard-to-predict demand, short product life cycles within large assortments, and supply chains that are complex and often inflexible. The thesis examines how companies can mitigate this problem by building stronger supply chain responsiveness, focusing on two main levers: reducing lead times and reducing product and component variety.

The research is structured around four questions: (i) How can relevant product, demand and supply characteristics guide decisions about which segments to target for enhanced responsiveness?; (ii) How can investments in supply chain responsiveness be systematically justified?; (iii) How can initiatives for supply chain lead-time reduction be systematically identified and prioritized?; and (iv) How can product variety be reduced to facilitate responsiveness? To answer these questions, the thesis applies a problem- and theory-driven research design combining conceptual development from the literature with empirical case research. It comprises one systematic literature review and six empirical studies conducted in collaboration with a global direct-to-consumer jewelry brand. The company's broad product assortment and vertically integrated supply chain provide a rich setting for investigating such issues.

The thesis makes four contributions aligned with the research questions. First, the thesis offers empirical evidence linking product, demand, and supply-chain characteristics to recurring stockout and overstock patterns, allowing firms to identify where responsiveness is most needed. Second, it develops a framework to quantify the value of lost sales arising from insufficient responsiveness and presents a general model that illustrates when investing in a responsive production line is justified, based on costs and recoverable sales. Third, it offers a structured, empirically evaluated framework for identifying and prioritizing end-to-end lead-time reduction initiatives, moving beyond ad hoc, locally optimized projects. Fourth, it provides guidance on reducing structural complexity through product elimination and component commonality, positioning variety management as an enabler of responsiveness.

For academia, the thesis consolidates fragmented research streams by offering a more integrated conceptualization of responsiveness and grounding it in item-level evidence from an assortment-intensive, design-based context. Notably, it provides a foundation for continued scholarly discussion of a topic that is becoming increasingly relevant in a fast-paced and volatile business environment. For practitioners, the thesis offers a structured pathway from responsiveness as an ambition to responsiveness in action, providing guidance on where to focus responsiveness efforts, how to justify investments, how to prioritize initiatives, and how to address structural drivers of slow replenishment. Empirical work across different studies demonstrates performance improvements in the focal company by enhancing supply chain responsiveness and potential revenue gains exceeding DKK 250 million under a proposed implementation over a 2.5-year planning horizon. Beyond the focal company, the thesis provides transferable concepts and decision-support artefacts that can be adapted across industries facing similar challenges.