Product Acquisition Management for Effective Remanufacturing

As industries transition toward circular economy principles, remanufacturing has become a key strategy for reducing waste, extending product lifecycles, and improving resource efficiency. However, its success heavily depends on Product Acquisition Management (PAM)—the process of acquiring used products (cores) that can be refurbished and reintroduced into the supply chain. Unlike traditional supply chains, remanufacturing relies on uncertain product returns, variable core quality, and unpredictable customer behavior, making PAM one of the most critical yet complex components of closed-loop supply chains (Guide & Van Wassenhove, 2001). A key challenge in remanufacturing is ensuring a steady supply of high-quality returned products, which requires effective product acquisition strategies such as buy-back programs, voluntary take-back schemes, and contractual agreements (Daniel et al., 2000). The effectiveness of these strategies varies across industries due to differences in product characteristics, customer return incentives, regulatory frameworks, and reverse logistics complexities.

Recent research by Bansal et al. (2024) highlights that closed-loop supply chains with remanufacturing face significant challenges related to return rate variability, cost uncertainty, and consumer engagement. Many operations management models assume return rates as fixed parameters or decision variables, yet empirical evidence on how consumers actually decide to return products remains limited. Understanding the behavioral factors influencing return rates is essential to improving the accuracy of acquisition models and the effectiveness of remanufacturing supply chains. While past research has focused on logistics optimization, cost efficiency, and sustainability benefits of remanufacturing, there remains a gap in linking consumer return behavior with operational decision-making models (Kianpour et al., 2017). Consumer willingness to return products depends on multiple factors, including financial incentives, convenience, trust in the manufacturer, and environmental awareness (Autry et al., 2007). However, remanufacturing firms often design return programs without a data-driven understanding of how these factors influence participation rates. To address this gap, this thesis will examine industry-specific product acquisition models, investigate consumer return behavior using conjoint analysis, and explore how return rates are incorporated in operations research models.

The Objectives of the Master Thesis are to:

- Review and classify product acquisition strategies in different industries and identify key challenges in acquiring used products, such as core quality variability, return uncertainty, and reverse logistics costs.
- Examine how return rates are modeled in operations research literature, assessing whether they are considered fixed parameters or decision variables and how these assumptions impact strategic decision-making.
- Conduct a conjoint analysis to quantify consumer preferences for different return program attributes, evaluating the impact of factors such as financial incentives, convenience, and sustainability motivations on return rates.
- Compare theoretical models of return rate management with empirical consumer insights to identify gaps between academic research and industry needs.

- Provide recommendations for remanufacturing firms to improve their acquisition management strategies and enhance sustainability.

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Selected Literature Recommendations:

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