Extended Abstract: Shifting the Burden in Fashion: A View on Fast Reordering Production Strategies Business Models

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Fashion supply chains are structurally vulnerable to demand–supply misalignment. High demand volatility, short selling windows of around ten weeks, and upstream lead times of three to six months (Ye et al., 2023) force firms to commit to production decisions long before reliable market information is available (Anitha & Neelakandan, 2025). This creates a recurring trade-off between overproduction, leading to inventory costs, markdowns, and regulatory risk under the EU Ecodesign for Sustainable Products Regulation (ESPR, 2024/1781; European Commission, 2024), and unmet demand, which is largely irrecoverable once a collection's selling window closes (Talay et al., 2022).

Digital Textile Microfactories (DTMFs), combining digital design, inkjet printing, laser cutting, and semi-automated assembly (Artschwager et al., 2023), have been proposed as an agile, on-demand production concept that enables Fast Reordering Business Models (FRBMs) (Winkler et al., 2022). Under FRBMs, retailers may place smaller initial orders and rely on rapid, point-of-sale-triggered replenishment during the selling season, reducing dependence on forecast-driven upfront production (Winkler et al., 2022). However, while this approach may alleviate retail-level inefficiencies, its upstream supply chain implications remain underexplored (Tilebein, 2022).

This paper presents a qualitative System Dynamics approach, using Causal Loop Diagrams (CLDs), to examine the unintended economic consequences of DTMF-enabled FRBMs. Given the early-stage nature of DTMFs, the aim is not quantitative prediction but the exploration of feedback structures, delays, and systemic dynamics (Wolstenholme, 1999). The study follows a four-stage modelling process: literature synthesis, dynamic hypothesis formulation, CLD development, and structural validation through polarity consistency and boundary adequacy checks. System archetypes are applied retrospectively as interpretive tools rather than predefined frameworks (Lane & Smart, 1996), enabling comparison with established patterns of instability and risk displacement (Wolstenholme, 2003).

The integrated CLD identifies nine feedback loops across five clusters: demand–fulfilment planning, responsiveness, capacity and inventory constraints), upstream buffering and lead time effects, and cost–margin feedbacks. These clusters generate cross-tier trade-offs that are not visible from a single supply chain perspective. At the retail–DTMF level, fast reordering enables rapid replenishment that reduces unmet demand within the selling window without relying on forecasts or long lead times (Moyano-Fuentes et al., 2020). Since unmet demand is lost after collection closure (Talay et al., 2022), this can reduce overproduction ex ante (Chen et al., 2019). However, fast reordering increasingly replaces rather than complements planning-based adjustments under limited cross-tier coordination (Lu, 2021).

Upstream, shorter processing times and higher replenishment frequency results in suppliers responding with higher safety stocks, larger inventories, and increased raw material production (Moyano-Fuentes et al., 2020; Vanichchinchai, 2019). While this preserves flexibility in DTMF contexts (Mishra et al., 2025), it increases capital lock-up and cost exposure. Over time, these inventories raise raw material costs, which transmit downstream via higher input prices and lower retailer margins (Manzoor et al., 2022), with effects that accumulate outside immediate retail decision horizons (Lee, 2021).

Viewed through the Shifting the Burden archetype (Kim, 1992, 2000), the analysis reveals a structural vulnerability in fashion supply chains. Fast reordering alleviates short-term demand–supply mismatches while shifting buffering and adjustment pressures upstream toward Tier-2 suppliers. As dependence on this symptomatic solution grows, incentives for more fundamental solutions, such as coordinated buffering, selective capacity planning, and cross-tier design alignment, weaken over time (Krishnan & Winter, 2010; Wolstenholme, 2003).

This study contributes to the SD and supply chain literature in three ways. First, it conceptualises fast reordering as a structural response to irreversible demand uncertainty rather than purely an efficiency mechanism. Second, it shows how responsiveness-enhancing digital production technologies can trigger a classic Shifting the Burden dynamic, even when they reduce overproduction locally. Third, it highlights the role of tier-specific inventory characteristics and temporal irreversibility in shaping how risk and cost propagate across supply chain tiers. Overall, the findings demonstrate the value of qualitative SD modelling as an early-stage diagnostic tool for emerging business models (Veldhuis et al., 2023), while providing a basis for future quantitative and empirical research as DTMF adoption evolves.

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