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Yarn to Fashion Supply Chains - Exploring the Circular Business Models in the Textile and Clothing Industry

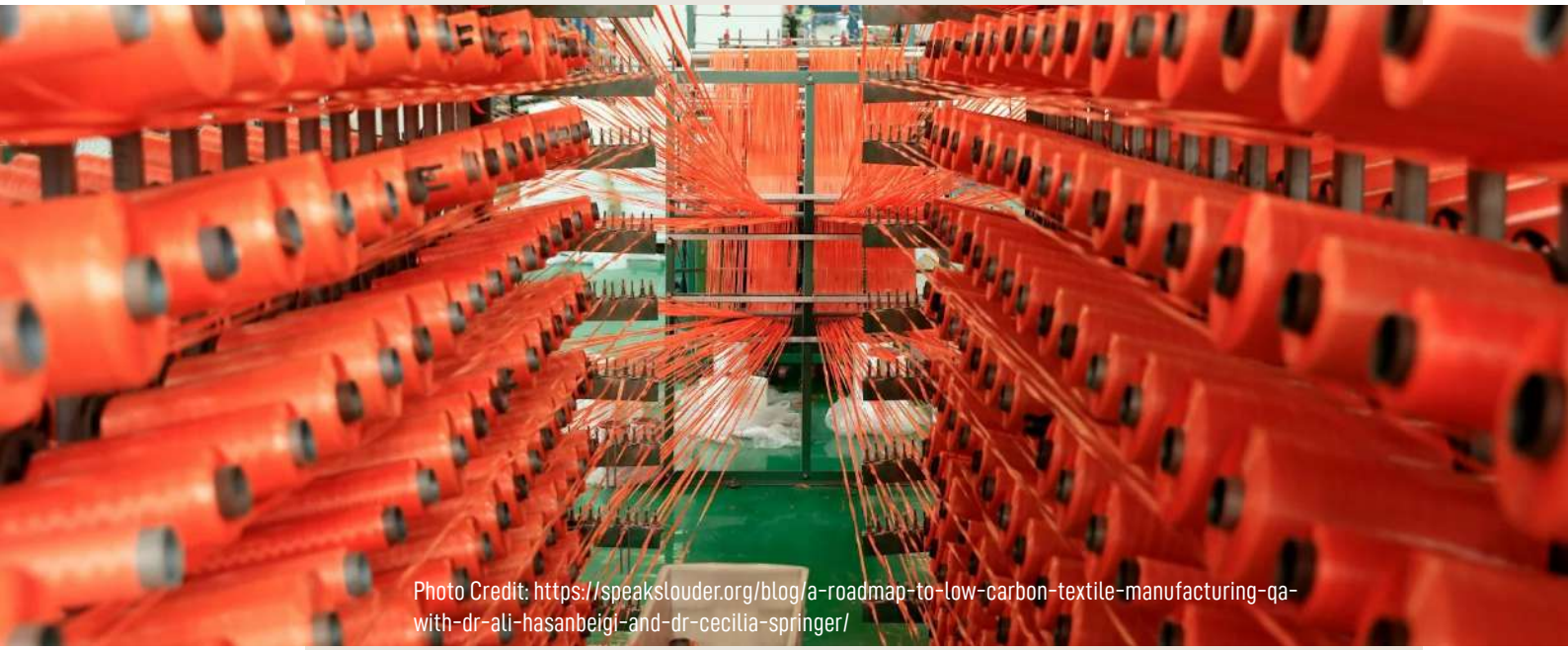


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The textile and clothing (TC) industry is one of the most polluting and resource-intensive industries in the world [1]. The current linear system of TC supply chains is environmentally damaging since it uses 20% of global water consumption and emits 10% of the global CO_2 emissions [2]. The circular economy (CE) has been identified as a promising solution to address these rising sustainability issues for the TC industry [3]. Thus, governments, academics, and customers pressure firms to manage their waste and pursue value-retention options, ensuring an efficient circular supply chain. Sri Lanka is a leading apparel manufacturer, and to stay competitive globally, the sector needs to strengthen brand identity mainly by meeting customer requirements.

From the perspective of a business, adopting CE involves integrating the supply chain and value framework; value creation, capture, and delivery [5] and developing a Circular Business Model (CBM). In simple words, CBM is a model that enables organizations to create, deliver, and capture value while keeping resources at their highest value for a longer period [3]. With the transition to CBMs, firms move towards regenerative approaches to minimize waste and environmental impact resulting from designing, producing, reusing, recycling, and responsible disposal [2].

Recent TC industry reports highlight a slow transition to CBMs [3] due to many reasons such as managerial reluctance, complexity incurred, limited knowledge of CE, and issues in scalability. Thus, through this study, we aim to help a smooth CBM transition in the TC industry by addressing the negativities.

Transition to a CBM in the TC industry

The transformation process to a CBM is dynamic, emphasizing that the journey to become a CBM is far from easy [1]. Also, research indicates that this change is more aligned with the iterative process of try-learn-adjust-try rather than a sequential process with steps and guidelines. Moreover, the supply chain is the major component that faces complexity and the effects of this transition. Hence, discussing successful practices applied to the supply chain in the transition process is a must.

Salmi et al.[1] has mentioned four types of CBM transitioning in TC industry, as shown in Figure 01. To form those types, they have considered the nature of transition and degree of circularity.

- Considering the nature of CBM transition, companies that had already transformed into a circular model were classified as "circular incumbents", and companies founded on CE principles were called "born circulars".
- Considering the degree of circularity, classification is as follows: "partially circular" and "fully circular".

It is essential to make a comparison among these CBM types to gain better insights into CBM adoption. We conducted 10 interviews with senior managers representing 8 TC companies in Sri Lanka. The cases were selected with an inclusion criterion based on their CBM transition method. The representation of companies across levels of transition is presented in Figure 01. The company profile and CE adoption are elaborated in Table 01. The interviews were coded and then analyzed using content analysis.

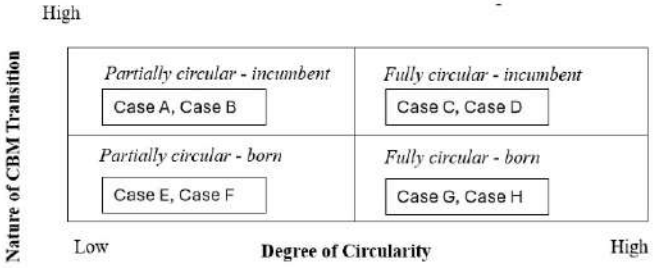


Figure 01 - Case representation across transition levels

Table 01 - Case profiles

CBM transition type	Company	Textile/ Apparel	CE options implemented
Partially circular – incumbent	Company A	Apparel	Closing the material product lifecycle , using fewer resources per product, product life extending practices
	Company B	Apparel	Closing the material product lifecycle , using fewer resources per product, product life extending practices
Fully circular - incumbent	Company C	Apparel	Recycling, using fewer resources per product, product life extending practices
	Company D	Apparel	Renting, using fewer resources per product
Partially circular - born	Company E	Textile	repairing, closing the loop through improving material product lifecycle
	Company F	Apparel	Cloth renting
Fully circular - born	Company G	Textile	Recycling, using fewer resources per product, product life extending practices
	Company H	Apparel	Upcycling, using fewer resources per product, product life extending practices

"Partially circular – incumbent" transition

This transition type tends to focus mainly on reduce, reuse, recycle and refuse concepts. Reduce, reuse, and recycle circular options have mainly evolved within the planning phase. Here, in these options, a firm tends to focus on planning the whole supply chain. Strategic decisions for the supply chain should be made in relation to the above circular options. When manufacturing, these CBMs avoid unsustainable resources and

materials (refuse) and utilize recycled and degradable materials. During sourcing, they focus on multipurpose resources and material minimization for production (reduce). Moreover, the reusing concept makes it mandatory to have an effective reverse logistics system, emphasizing the need to have a proper process for returning operations.

"Fully circular - incumbent" transition

These CBMs focus only on a few circular options such as recycle, reduce, reuse, refuse, and renting. The recycling option is mostly integrated within the whole supply chain. When implementing the recycling option, it should first be strategically aligned with the business through the planning phase by ensuring a smooth product and supply flow. Several strategies can be implemented for this, such as going for a niche market and gaining a competitive edge through recycling. Renting is another option that is used to be fully circular, and here, specifically, strategies should be implemented to ensure the reverse logistics part under the return operation.

"Partially circular - born" transition

Partially, these companies tend to follow repairing, renting, and closing-loop strategies. All these options are integrated with the planning stage, emphasizing that strategies should be linked strategically to the business. Manufacturing has also prioritized make-to-order strategies over make-to-stock, since that enables better demand alignment with customization and reduces wastage.

"Fully circular - born" transition

This transition emphasizes recycling, reusing, and reducing. As is common to all above transition levels, alignment with the business strategy is crucial for this transition to ensure that circularity is achieved through the entire supply chain. Considering recycling options, these CBMs focus on sourcing materials with return, disassembly, and recovery, and minimizing waste. To integrate recycle, reduce, and reuse options into manufacturing processes, these CBMs adopt a "make-to-order" strategy and minimize negative effects such as overstocking. Having an effective reverse logistics process is highlighted here, as it is prioritized by recycling-enabled companies.

In summary, our research identified that all transitions towards CBMs are possible with careful attention paid during the planning stage of the supply chain, as it aligns the circular options in a broader picture for the supply chain. It emphasizes the idea of the need for collaboration and coordination between the tiers of this TC supply chain. Importantly, with the circular options adopted at each level of transition, the logistics phase is not usually applied. Thus, we pinpoint that more circular objectives could be achieved once circularity options are aligned with logistics operations. Overall, circularity is beyond achieving sustainability; it is an operational transformation of the entire supply chain system.

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Article by

Ayani Maheepala, Jayani Sudusinghe

Department of Transport Management and Logistics Engineering, Faculty of Engineering, University of Moratuwa