

7 R's of Sustainable Packaging Framework – Systematic Review of Sustainable Packaging Solutions in the Apparel and Footwear Industry.

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Rationale. Packaging waste represents a significant part of the municipal solid waste stream, and it raises many environmental concerns. According the US Environmental Protection Agency report for 2018, packaging waste in America accounted for 82.2 million tons or 28% of the total waste generated in that year (EPA, 2018). The Apparel and Footwear industry solely creates a large amount of packaging waste that filters through the entire value chain. Packaging is used to not only protect, handle and transport product parts, but also to distribute the final goods to the consumers. The common packaging materials used in the apparel and footwear industry include various petroleum-based, non-biodegradable polymers used to produce single-use plastic packaging (polyethylene, polypropylene, etc.) bags, wraps, and inserts.

To contribute to the United Nations Sustainable Development Goal 11 (Sustainable Cities and Communities) and Sustainable Development Goal 12 (Responsible Consumption and Production) which urge waste reduction in cities, communities, and from within the supply chain, innovative sustainable packaging solutions are gaining popularity among scientists, international, national, and local governments, and retailers (Islam et al., 2020; McKinskey Report, 2020). Nevertheless, evaluation of the existing evidence concerning sustainable packaging in apparel and footwear industry is missing (Islam et al., 2020). Hence, there is no clear understanding of what constitutes ‘sustainable packaging’ and what kind of ‘sustainable packaging’ solutions are already available (Sonneveld et al., 2005; Lewis et al., 2007; McKinskey Report, 2020). To fill this knowledge gap, the main purpose of this systematic review is to identify, summarize, and evaluate the existing sustainable packaging solutions in the apparel and footwear industry in order to establish a sustainable packaging framework which intends to position new theoretical and practical sustainable packaging advancements.

Method and Approach. This study follows principles of systematic review research methodology via website searching (Stansfield et al., 2016). Because the scope of this study was exclusively tied to apparel and footwear brand solutions for sustainable packaging, literature for this systematic review was collected by searching primary sources of relevant information found on the brands’ official websites, and from available sustainability reports (Stansfield et al., 2016). The study was organized in five research stages: (1) planning the search, (2) executing the search, (3) screening records for relevance and data management, (4) data analysis, and (5) synthesis and results reporting (Stansfield et al., 2016). In the first two stages, the Python programming language libraries were used to develop a web scrapper which yielded an initial sample of 574 official websites of international retail brands that advertised sustainable packaging solutions for their apparel and footwear products (Mitchell, 2018). After exclusion of

websites that contained mainly non-English content, and websites that were identified as a secondary source (e.g., blog rather than an official website), the final sample for the systematic review included 478 websites/brands (N=478). In the following two stages, each brand's website was manually and iteratively browsed. As appropriate, different search techniques were used, such as searching using a generic search function, navigating headings within webpages, or scanning attached sustainability reports. Records of how each website was searched were kept ensuring that the same process can be replicated. A Microsoft Excel worksheet was used to compile relevant data. Qualitative analytical method-thematic content clustering (Braun & Clarke, 2006) was utilized to identify, summarize and evaluate findings. Thematic coding was carried by two researchers with the intention to reach an absolute agreement about emerging thematic clusters (Fingfeld-Connett, 2014). In the final stage, based on research findings, the 7 R's Sustainable Packaging Framework was proposed.

Results. This research provides evidence that 478 international apparel and footwear brands are, to a different degree, committed to improved packaging solutions for their products. To reduce package waste generation, brands were found to invest in seven different packaging strategies (including *re-thinking, refusing, reusing, reducing, repurposing, recycling and rot*) which we coined as the *7R's sustainable packaging framework* (Table 1.) Specifically, 8% of brands (n= 36) have joined the *Responsible Packaging Movement*, and/or joined the *Ellen McArthur Foundation* to rethink actual packaging solutions to establish circular solutions for plastic waste. These brands refuse to use disposable plastic bags in their stores and they already adopted paper-based packaging alternatives. 15% of brands (n= 74) are offering re-usable packaging services through collaboration with third party packaging providers. For instance, brands commonly collaborate with *Re-pack* and *Noissue Eco Packaging Alliance* that respectively offer re-usable and recycled or compostable packaging services for ecommerce. Furthermore, 21% of brands (n=101) are reducing the negative impact of their packaging by improving the quality, and recyclability of packaging ingredients by accepting legit, third party certifications for the entire package or more commonly its components (e.g., GRS, GOTS, FSC). In most of these brand cases, the packaging is fully recyclable, while in some instances the package can be repurposed (e.g., re-usable organic fabric wrap can be used as a gift bag or scarf). Nevertheless, 13% of brands (n= 62) are invested in *rot* packaging solutions where conventional plastic materials are replaced with biodegradable and compostable alternatives (e.g., TIPA compostable packaging, plant-based packaging). Finally, 43% of brands (n=205) promote their long-term commitment to switching to sustainable packaging by admitting that they are either testing sustainable prototypes, or they do not have yet improved packaging solutions.

Table 1. The 7R's of a sustainable packaging framework

7 R's Sustainable Packaging Framework	
<i>Solution</i>	<i>Description of solution</i>
Rethink	Rethinking packaging design and proposing new circular solutions.

Refuse	Refuse to overpack products, and/or refuse to use single use plastic packaging.
Reuse	Packaging materials are used more than once in their original form.
Reduce	Reducing packaging weight, size, or reducing quantity of materials.
Repurpose	Packaging in its original or changed form have an alternative purpose.
Recycle	Mechanically or chemically converting packaging waste into new materials.
ROT (composting)	Composting bio-based packaging after use.

Implications. Retailers can utilize this framework to establish new or revised criteria in creating advancements in sustainable packaging solutions. Depending on the type of the products business offers, some changes may be easier to test and implement than others. The 7R's approach might be considered as a gradual pathway towards sustainable packaging where the proposed framework includes mutually inclusive, and complementary approaches.

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