

Design and Evaluation of Modular Wedding Dresses: Towards Circularity in the Bridalwear Industry

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Background and objective: Repeated use of products at their highest value is one of the main principles of circular economy and fashion (Ellen MacArthur Foundation, 2020; Kirchherr et al., 2017). Circular economy provides a framework for designing products with physical and emotional durability, repairability, and adaptability to changing needs and circumstances (Ellen MacArthur Foundation, n.d.). Modular design is an approach that allows adaptability and modification leading to extended product use and reduced replacement and waste (Bocken et al., 2016; Dan et al., 2023). The objective of this study was to design and evaluate a modular wedding dress collection that allows customization and transformation into different styles for use in the future for occasions such as anniversaries and parties. This study and the designs address a gap in the extant literature as there is limited research on sustainable bridalwear, specifically with a focus on a modular design that emphasizes versatility and longevity. By incorporating circular design principles such as modularity and customization, wedding dresses can enable extended usability and relevance and contribute to sustainable consumption and circularity in the apparel industry (Ellen MacArthur Foundation, 2020; Niinimäki et al., 2020). This can provide the opportunity for consumers to use their dresses in different ways during weddings, potentially eliminating the need for a second dress, as well as to experience their wedding dresses more than once, transformed to be suitable for other occasions. Special features such as detachable and exchangeable components, convertible styles can allow modularity, customization, transformation.

Method, design process, and techniques: The study unfolds in three distinct phases. *In Phase 1*, to explore and discern brides' needs and desires concerning wedding dresses, in-depth interviews were conducted with two participant groups: women (15) who plan to marry and wear a wedding dress and bridalwear industry professionals (4). Participants were also presented with initial sketches of modular designs developed based on trend analysis and literature to gather their feedback and inform the design process. Synthesizing insights from participant feedback, literature review, and trend analysis helped to establish the design criteria for the collection. *Phase 2* involved the conceptualization and design of the modular wedding dress collection, guided by the insights gleaned in Phase 1. Reflecting the concepts of modularity, the collection comprises four complete looks (described below) with transformable, detachable, and interchangeable components, tailored to address consumer preferences identified earlier. Designs incorporate modular components allowing customization and certain flexibility for different body shapes and styles. Traditional embroidery and beading techniques as well as additional non-white colors were incorporated to enhance the designs. *Phase 3* involved presenting the designed collection to Phase 1 participants for feedback, aimed at examining their perceptions and acceptance of sustainable modular wedding dress options and identifying areas for further enhancement of the designs.

Results: Most women interviewed desired for their wedding dress to communicate their identity and the significance of the day, to enhance their self-esteem and beauty. Brides' preferences also mirrored broader trends and social/family expectations. Importance of fit and comfort was emphasized by most. New dresses were preferred over rented or repurposed ones; the dress was perceived as a symbolic keepsake or heirloom. Sustainability was not a high priority for the women when it came to wedding dress selection, but the professionals noted a growing willingness in younger brides to explore options. While some participants were hesitant about "damaging" their dress or appearing "plain white" or "too fancy," most were open to modifying their wedding dresses to wear in future occasions, stating that "it won't be a waste" or "it will remind me that I am always a bride." Professionals saw the concept of modularity as an exciting and positive opportunity. Participants also provided feedback on intrinsic attributes such as color, style, fabrics, as well as prices, post-wedding plans for dresses, and other individual and socio-cultural influences. The four looks developed in the study are described below.

Look One: "Ethereal Opulence": A three-piece ensemble featuring a form-fitting long lace dress, a matte-taffeta drape top, and a full open-front skirt adorned with rhinestones, sequins, and pearls. *Transformation:* Transforms into a peplum dress with a purple overdress and belt, embellished with floral and beaded detailing, accompanied by a transparent scarf and headband.

Look Two: "Pearl Cascade": An asymmetrical long dress with an off-shoulder bodice and detachable pearl-string bishop sleeves. *Transformation:* Converts into a balloon dress with a high-low hemline via a flip-up skirt tied with a drawstring, complemented by floral belts and a rhinestone-beaded headband.

Look Three: "Enchanting Bloom": A multi-part ensemble comprising an intricately beaded undertop, a bandeau lace dress, detached statement sleeves, and a detachable mermaid tail skirt. *Transformation:* Transforms into a modern cocktail dress with an elegant hem detailing and is complemented by interchangeable parts such as a transparent cape and floral cinch-waist belt.

Look Four: "Ombre Radiance": A lace short dress with a flappable neckline, accompanied by a beaded corset, detachable transparent tail, and bow. *Transformation:* Evolves into a halter neck dress revealing ombre floral beadwork and a customizable colored ribbon tied elegantly at front or back waist.



Look One & Look Two



Look One Transformed



Look Three & Two Transformed

In Phase 2 interviews both participant groups expressed appreciation for the craftsmanship and aesthetic appeal of the designs. The modular design concept and the versatility and extended use it allowed in wedding dresses was received highly positively, described as innovative and capable to transcend the

traditional role of single-use wedding attire. Most participants agreed that the multifunctionality and uniqueness adds value and could be a selling point for brides looking for dresses to serve different purposes. Cost effectiveness was also a plus. Feedback was received on the colors, design elements, and other features as well as price considerations and willingness to wear and pay for the dresses.

Conclusions: Modular design is an innovative approach in the fashion industry, particularly in the bridal sector. While features like detachable skirts have been used in bridalwear, true modularity and the concept of repeated use have not been addressed. Modularity aligns with the principles of circular fashion and promotes extension of product usefulness and relevance, reducing waste, and contributing to a more sustainable future for the fashion industry. This concept challenges the traditional notion of a single-use wedding gown by offering versatility and adaptability for use on various occasions. It also introduces creativity and market expansion opportunities for bridal industry. For consumers, modular dresses offer enhanced personalization, fostering emotional connections, economic value, and eco-friendliness. This research advances the knowledge on circular fashion and sustainable design, providing insights into modular design processes and consumer behavior.

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