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DESIGN STRATEGIES FOR SUSTAINABLE FASHION: DEVELOPING A MULTIFUNCTIONAL CAPSULE COLLECTION TO PROMOTE RESPONSIBLE CONSUMPTION

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This paper examines sustainable fashion design through the lens of circular economy principles, proposing a multifunctional capsule collection as a design strategy to address overconsumption. Drawing on research-through-design and life-cycle thinking, the study investigates how modular construction and garment transformability can extend service life and increase utilisation. The method combines (i) a review of design-for-longevity approaches and (ii) the development of an interchangeability matrix to maximise outfit combinations from a limited set of garments. The analysis indicates that system-level wardrobe design – prioritising interoperability, repairability, and contextual adaptability – can reduce replacement demand and support more responsible consumption practices.

Keywords: *circular fashion; modular garment design; life-cycle thinking (LCA-informed principles); responsible consumption; multifunctional design.*

INTRODUCTION

The environmental crisis is associated with fast fashion and overconsumption. Over the past two decades, the fashion system has increasingly operated under a “fast fashion” logic: accelerated trend cycles, low unit prices, and high product turnover. This model normalizes frequent purchasing and short periods of use, with garments often treated as semi-disposable [1, 4]. From a sustainability perspective, the core issue is not only how clothing is produced, but how clothing is used: the environmental burden of a garment is strongly shaped by its service life, utilization rate, and end-of-life pathway. When garments are worn infrequently, replaced quickly, or discarded prematurely due to fit issues, aesthetic fatigue, or minor damage, the material and energy invested across fibre production, manufacturing, transport, and care yield relatively little “use value” per unit of impact.

Fast fashion also amplifies systemic externalities: resource depletion (water, land, fossil inputs), chemical loads from dyeing and finishing, microfibre pollution linked to synthetics, and waste accumulation driven by landfill and low-quality recycling streams. Crucially, these impacts are entangled with cultural and economic drivers—status signalling, novelty seeking, algorithmic trend diffusion,



and price structures that privilege volume over durability [2]. In this context, design is not a neutral styling exercise; it is a strategic intervention point that can shape consumption patterns, user attachment, and garment longevity [3].

PURPOSE

Problem statement: how can design reduce the need for excessive garment purchasing? The central design problem can be framed as follows: if excessive purchasing is partly a functional response to wardrobe gaps (insufficient versatility, mismatch with contexts, limited combinability) and partly an emotional response to novelty (desire for change, boredom, identity experimentation), then design strategies should address both the utility and the meaning of clothing over time. Conventional sustainability approaches frequently focus on material substitution (e.g., “better” fibres) or production-side improvements (e.g., reduced waste in cutting). While important, these approaches may deliver limited systemic benefit if garments remain short-lived in practice.

Therefore, the research problem shifts from “How do we make garments greener?” to “How do we design garments that people need to buy less often, because each item does more work, remains desirable longer, and is easier to maintain and adapt?” This requires moving beyond single-function apparel and toward garments conceived as flexible systems. It also requires acknowledging the user as a co-producer of sustainability outcomes: design must enable repeated styling, contextual adaptability (work, leisure, formal, travel), repairability, and reconfiguration without requiring additional purchases.

A design-led response is to develop a capsule collection – an intentionally limited set of interoperable garments enhanced through multifunctionality and modularity. In this model, value is generated not by constant replacement but by combinatorial richness, transformability, and durability of aesthetic relevance [5]. The hypothesis is that a well-designed modular capsule can reduce acquisition pressure by expanding outfit possibilities per garment and by supporting evolving needs (seasonality, body fluctuation, social contexts) through reconfiguration rather than replacement. The aim of this research is to develop and evaluate a modular, multifunctional capsule collection designed explicitly to extend garment life-cycle thinking and to promote responsible consumption. The proposed collection is not merely “minimalist” in quantity; it is engineered as a wardrobe infrastructure that supports diverse use scenarios through a small number of adaptable pieces [5;6;9].

This aim includes several interrelated objectives:

1. Extend functional longevity: design garments to remain usable across multiple contexts and seasons through transformability (e.g., adjustable silhouettes, removable layers, reversible surfaces) and modular components (e.g., interchangeable collars, sleeves, panels, belts [8]).
2. Extend emotional longevity: support sustained user attachment by enabling personalization, variability, and identity expression without continuous purchasing. Multifunctionality should not look like compromise; it should feel like capability [6].



3. Improve maintenance and repair trajectories: incorporate construction details that simplify care, enable component replacement, and reduce end-of-life discard driven by localized damage.

4. Increase wardrobe efficiency: maximize combinability across a constrained set of pieces, thereby increasing the number of distinct outfits per item and reducing the perceived “need” to buy additional garments [4, 8].

The broader contribution is to articulate a design strategy that operationalizes responsible consumption at the level of product architecture: garments as modular platforms rather than static objects. In this sense, the capsule collection functions as a design prototype for a different consumption logic—one oriented toward use intensity, adaptability, and long-term value.

RESULTS AND DISCUSSION

Matrix Structure (Example for a 7-Piece Capsule a baseline model for a young women’s wardrobe). Seven ‘smart’ garments were specified (sustainable and multifunctional) that can generate more than 25 outfit combinations, supplemented with accessories, enabling personalisation.

Tops / Bottoms	A. Trousers	B. Skirt	C. Shirt Dress
1. Classic White Shirt	Outfit 1 (Business)	Outfit 2 (Chic)	Outfit 3 (Layering)
2. Reversible Top (two-sided)	Outfit 4 & 5	Outfit 6 & 7	Outfit 8 & 9
3. Modular Hoodie (detachable sleeves)	Outfit 10 (Casual)	Outfit 11 (Sporty)	Outfit 12 (Street)
4. Blazer/Jacket (Layer 3)	+3 variants	+3 variants	+3 variants

Design Strategies for Maximum Efficiency

Wearability was supported through (i) a restricted colour palette structured by the 60–30–10 rule, and (ii) technical modularity enabling garment reconfiguration. Detachable sleeves convert a hoodie into a gilet; concealed fastenings enable adjustable garment length (e.g., a shirt dress reconfigured as a tunic); and reversible construction effectively doubles styling options without producing additional garments.

Sustainability Indicators (Quantitative Analysis)

To support the concept of ‘responsible consumption’, the following indicators were included:

1. *Versatility Ratio*: Versatility Ratio = Number of outfits / Number of pieces. Example: 25 outfits / 7 pieces = 3.57. A score above 3 is considered excellent for sustainability.

2. *Cost-per-Wear (CPW) Projection*: For example, a 1000 MDL garment worn 100 times (10 MDL per wear) is cheaper and more sustainable than a 200 MDL garment worn only twice (100 MDL per wear).

3. *Waste Avoidance*: Waste avoidance can be estimated by calculating how many kilograms of textiles are ‘saved’ when users no longer purchase separate items for the same functions.



CONCLUSIONS

An interoperable seven-piece capsule can deliver substantial outfit variety while reducing redundancy. By prioritising transformability, modular components, and serviceable construction, the proposed approach supports longer garment use, mitigates “wear fatigue”, and can reduce replacement-driven purchasing. As a result, system-level wardrobe design offers a practical pathway for aligning everyday dressing practices with responsible consumption and circularity.

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