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From Waste to Fashion – A Fashion Upcycling Contest: A Critical Review

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Abstract: *The paper presents a case study of the TAP (Portuguese Airline Company) Upcycling Project, which challenged two young fashion designers to create garments from waste textiles sourced from decommissioned aircraft. The work is positioned within the broader context of circular economy and sustainability in the fashion industry, demonstrating how creative design processes can transform industrial waste into valuable fashion products. This critical review also emphasizes emerging research directions and strategies where advanced characterization and design approaches may help unlock the full potential of fashion upcycling.*

Abstrak : *Tulisan ini menyajikan studi kasus mengenai Proyek Upcycling TAP (Transportes Aéreos Portugueses), yang melibatkan dua desainer mode muda untuk menciptakan busana dari limbah tekstil yang bersumber dari armada pesawat purnatugas. Penelitian tersebut diposisikan dalam kerangka ekonomi sirkular dan keberlanjutan pada industri mode yang lebih luas, guna mendemonstrasikan bagaimana proses desain kreatif mampu mentransformasi limbah industri menjadi produk mode yang bernilai tinggi. Tinjauan kritis ini juga menekankan arah serta strategi penelitian kontemporer, di mana karakterisasi tingkat lanjut dan pendekatan desain dapat berperan penting dalam mengoptimalkan potensi penuh dari praktik upcycling dalam industri mode.*

Keywords : *Critical Review, Fashion, Product, Upcycling*

INTRODUCTION

The multifaceted fashion sector, encompassing textiles, apparel, and footwear, exerts a profound environmental toll with escalating global repercussions (A. D. Marques et al., 2019). There is an urgent imperative for stakeholders and consumers to scrutinize the prevailing status quo, aligning industrial practices with the tenets of sustainability and the circular economy to safeguard 'our common future' (A. D. Marques et al., 2019) Within this framework, the circular economy serves as a strategic roadmap for the industry, fostering innovations such as cleaner production technologies, design for disassembly, and enhanced material recovery through upcycling and fiber reclamation (Stahel, 2016).

Historically, sustainability frameworks in waste management were predominantly centered on the tripartite '3Rs'—Reduce, Reuse, and Recycle—with the primary objective of mitigating environmental harm (A. D. Marques et al., 2019). However, the early 21st century marked a conceptual shift as McDonough and Braungart introduced a fourth dimension: 'Re-thinking' or '(Re)designing'

(McDonough & Braungart, 2010). This paradigm shift necessitates a fundamental reorganization of societal behavior, prioritizing Ecodesign and sustainable development processes that align with the demands of an increasingly environmentally conscious consumer base (Vezzoli, 2018).

Evidence of an emerging 'ethical consciousness' is increasingly apparent across various corporate sectors. Sustainable business models are designed to foster positive societal and environmental outcomes while mitigating adverse effects (Sawant et al., 2024), fundamentally adopting a human-centric approach that prioritizes individuals of all demographics and skill sets (Sawant et al., 2024; Stahel, 2016). Furthermore, the pervasive use of textiles and fibrous materials across multiple industries incurs a significant ecological footprint, occurring both during the manufacturing phase and at the conclusion of the product lifecycle (Slater, 2003). These environmental challenges are similarly reflected in related sectors, specifically the footwear and leather industries (A. Marques et al., 2017).

METHOD

The study employs a critical review design, that aims to evaluate the existing literature, identify conceptual contributions, and highlight contradictions or gaps within the current body of knowledge(Anh, 2024; Dede et al., 2026; Franzke et al., 2022; Gan et al., 2026; He et al., 2026; Henry & Liu, 2026; Karmakar et al., 2026; Magnuson et al., 2026; Marks et al., 2026; Mêda et al., 2026; Purssell & Gould, 2026; Thomas et al., 2026). The selected articles underwent a critical appraisal process. Rather than just summarizing the findings, each source was evaluated based on:

- Methodological Rigor: The validity and reliability of the evidence presented.
- Conceptual Contribution: How the study advances the theoretical understanding of the field.
- Contextual Relevance: The applicability of the findings to current industry or academic standards.

Data were extracted using a standardized thematic matrix, focusing on the core arguments, conflicting viewpoints, and identified limitations of each study.

RESULTS AND DISCUSSION

Strengths and Contributions

Practical Demonstration of Circular Economy Principles

The paper makes a valuable contribution by providing a concrete, real-world example of circular economy implementation in fashion design (A. D. Marques et al., 2019). The designers successfully transformed old textiles from plane seats and metal accessories from seat belts into a conceptual three-piece ensemble that earned third place in the competition. This practical case study effectively illustrates how waste materials can be revalued and repositioned as design resources rather than discarded

products. The tangible demonstration of upcycling, moving beyond theoretical discussions to actual product development, strengthens the arguments for sustainability in the fashion industry.

Detailed Process Documentation

The authors (A. D. Marques et al., 2019) provide thorough documentation of the complete design process, starting from problem identification and concluding with conceptual design product submission following fashion design methodologies. The step-by-step presentation of stages including initial sketching, material selection, pattern making, prototyping, and final construction offers valuable pedagogical insight into how designers navigate constraints imposed by sustainability requirements. This detailed process documentation is particularly useful for fashion design educators and students who seek to understand how creative problem-solving operates within the framework of resource limitations and environmental considerations.

Focus on Young Designer Engagement and Industry Collaboration

The paper (A. D. Marques et al., 2019) highlights the importance of challenges and contests in shifting industry paradigms and increasing creativity and beauty in fashion design. Furthermore, the collaboration between companies and organizations from different fields and businesses to stimulate the creativity of young professionals is presented as producing fantastic results. This emphasis on intergenerational engagement and cross-sector partnerships addresses a gap in the literature regarding how to foster sustainable design practices among emerging professionals.

Media Impact and Public Awareness

The significant media exposure obtained by the designers, including television coverage on RTP1 and multiple websites, is documented as an important outcome. The paper (A. D. Marques et al., 2019) emphasizes the critical importance of showing these cases to a broader audience and mainstream fashion consumers, noting that while circular economy and upcycling topics are commonly discussed in academic conferences, the audience is primarily researchers and experts. This recognition of the gap between academic discourse and public consciousness represents an important insight about the implementation challenges of circular economy principles.

Significant Limitations and Weaknesses

Narrow Scope and Limited Generalizability

A fundamental limitation is the paper's (A. D. Marques et al., 2019) extremely narrow scope it presents a single case study involving only two designers and one contest submission. While the TAP Upcycling Project is described as an example of challenges coming from several sectors and different organizations, the paper does not provide systematic analysis, comparative perspectives, or data from multiple similar initiatives. This severely restricts the ability to draw generalizable conclusions about

upcycling success, design methodologies, or industry feasibility. The findings cannot be reliably extrapolated to other fashion sectors, geographic contexts, or scales of production without substantial additional research.

Absence of Rigorous Methodology and Scientific Framework

The paper (A. D. Marques et al., 2019) lacks a formal research methodology, research questions, or hypotheses. There is no systematic data collection, no quantitative or qualitative analysis methods explicitly stated, and no structured evaluation criteria. While the paper (A. D. Marques et al., 2019) references the pyramid model presented by Hawley regarding waste textile conversion to new products, it does not employ this or other conceptual frameworks to analyze the case study rigorously. The work reads more as a descriptive industry report or design portfolio documentation than as academic research that could contribute to systematic knowledge about sustainable design practices. The absence of comparison to baseline practices, control conditions, or alternative design approaches further undermines the scientific rigor.

Lack of Quantitative Assessment of Sustainability Claims

While the paper (A. D. Marques et al., 2019) extensively discusses sustainability principles and circular economy concepts, there is no quantitative assessment of actual environmental impact or sustainability outcomes. Critical metrics such as carbon footprint reduction, resource consumption compared to conventional garment production, material waste percentages, water usage, chemical inputs, or end-of-life analysis are completely absent. The claim that textile wastes achieve "new consumers' value" and become "raw materials" to close the loop is asserted rather than demonstrated with evidence. Without lifecycle assessment data, material flow analysis, or comparative environmental metrics, the sustainability benefits remain largely rhetorical rather than empirically substantiated.

Insufficient Analysis of Design Constraints and Trade-offs

Although the paper (A. D. Marques et al., 2019) documents the experimental design process including sketches, material selection, and the incorporation of mandatory contest elements (crew coat inspiration, five-meter fabric limit, metallic belt requirement), there is minimal critical analysis of how these constraints affected design quality, feasibility, or commercial viability. The paper (A. D. Marques et al., 2019) does not discuss whether similar design quality could have been achieved with conventional materials, whether the upcycling process actually reduced costs or complexity, or how the specific constraints of waste materials influenced creative direction. The tension between design aspiration and material limitations is acknowledged but not deeply analyzed.

Limited Engagement with Circular Economy Literature

While the paper (A. D. Marques et al., 2019) mentions key concepts including reducing, reusing, recycling, and the Braungart and McDonough "re-thinking" paradigm, the engagement with circular

economy literature is superficial. The reference to Hawley's pyramid model of textile waste conversion is brief and not integrated into a comprehensive analytical framework. The paper (A. D. Marques et al., 2019) does not systematically address the difference between upcycling (redesigning waste into higher-value products) and downcycling, does not discuss technical versus biological cycles, and does not engage with debates about the actual feasibility of circular business models in capital-intensive industries like fashion. A deeper theoretical framework would strengthen the academic contribution.

Absence of Critical Reflection on Fashion Industry Readiness

The authors (A. D. Marques et al., 2019) note that "the fashion industry is not ready for it yet," referring to sustainable upcycling practices. However, this critical observation is stated without exploration. The paper does not investigate what systemic, economic, technological, or cultural barriers prevent broader adoption of upcycling. It does not discuss whether individual designer contests can meaningfully scale to address industrial waste volumes, or whether the approach is fundamentally dependent on niche markets willing to pay premium prices for upcycled goods. This lack of critical analysis of feasibility and scalability limits the practical impact of the work.

Limited Documentation of Jury Evaluation Criteria and Winner Selection

While the paper (A. D. Marques et al., 2019) mentions that the designers achieved third place "among eight final participants," there is no discussion of the contest rules, jury composition, evaluation criteria, or how winners were selected. This information is crucial for understanding whether the design merit, sustainability innovation, or creative execution drove the award. Without understanding what the competition valued, it is difficult to assess whether the case study represents best practices or merely one interpretation of acceptable upcycling design. The absence of comparative discussion of the other finalist entries further limits contextual understanding.

Weak Connection Between Academic Contribution and Conference Format

The paper (A. D. Marques et al., 2019) is positioned as a conference paper (29th CIRP Design 2019), yet it reads primarily as a practitioner case report or design documentation. For an academic venue, the paper (A. D. Marques et al., 2019) would benefit from explicit research questions, hypothesis testing, comparative analysis, or theoretical contributions. The current format seems more suited to a design industry publication or portfolio documentation than to academic peer review designed to advance disciplinary knowledge. The conference context raises expectations for novel insights or methodological contributions that this work does not fully deliver.

Clarity and Presentation

Strengths in Visual Documentation

The paper (A. D. Marques et al., 2019) excels in visual presentation, with numerous figures documenting the design process from mood boards through final prototypes. The moodboard, sketches, and subsequent development stages provide clear visual evidence of the creative process. The documentation of material selection and pattern making decisions, combined with photographs of prototypes and final products, effectively communicate the tangible design work. This visual strength makes the paper accessible and allows readers to understand practical design challenges.

Clarity Issues in Conceptual Framing

Despite the visual clarity, the paper's (A. D. Marques et al., 2019) conceptual organization could be improved. The introduction moves abruptly from broad statements about fashion industry environmental impact to specific contest participation without clearly establishing why this particular case study illuminates larger questions about sustainability or circular economy. The transition between sections feels more like chronological narrative than logical argument development. A clearer thesis statement early in the paper would help readers understand what specific insights about design, sustainability, or upcycling the authors intend to demonstrate.

Research Gap Identification and Recommendations for Improvement

Need for Comparative Case Analysis

Future work should expand beyond a single case study to compare multiple upcycling design projects, documenting variations in materials, constraints, design outcomes, and sustainability metrics. This would allow for pattern identification and more robust conclusions about design methodologies and sustainable fashion development.

Integration of Sustainability Measurement

The research would substantially improve by incorporating lifecycle assessment (LCA), material accounting, or quantitative sustainability metrics. Even modest metrics such as waste reduction percentages, material sourcing transparency, or energy comparison would strengthen claims about environmental benefits and provide data for industry practitioners to evaluate upcycling feasibility.

Engagement with Scalability and Business Model Questions

Research (A. D. Marques et al., 2019) should address the critical question of whether individual designer contests can meaningfully address textile waste at scale, or whether successful upcycling requires integration into broader business models and supply chain management. This would move beyond the observation that green is the color of next generations toward understanding the institutional and economic changes required to implement circular practices.

Formal Research Framework

Adopting explicit research questions, stated hypotheses, and systematic methodology would strengthen the academic contribution. Whether employing qualitative design research, grounded theory development, or comparative case analysis, a clearer methodological framework would enhance rigor and validity.

CONCLUSION

This paper makes a valuable practical contribution by documenting a real-world application of upcycling design principles and demonstrating young designer engagement with sustainability challenges. (Marques et al., 2019) The work effectively illustrates how circular economy principles can guide fashion product development. However, as academic research, the work is limited by its narrow scope, lack of rigorous methodology, absence of quantitative sustainability assessment, and insufficient critical analysis of feasibility and scalability. The paper would be strengthened through engagement with academic literature, explicit research questions, comparative analysis, and measurement of actual environmental outcomes. While the case study is interesting and well-documented visually, the paper's contribution remains largely descriptive and practitioner-focused rather than advancing systematic knowledge about sustainable design methodologies or circular economy implementation in fashion. The work is most valuable as a practitioner documentation or design pedagogy example rather than as a peer-reviewed academic contribution advancing theoretical or empirical understanding of sustainable fashion design.

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