

The Role of Indigenous Himalayan Crafts in Contemporary Circular Fashion: Opportunities and Challenges

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ABSTRACT

The fashion industry is currently shifting from a linear "take-make-waste" model to a restorative circular economy, and although the techno-centric recycling approach to industrial circularity has been the subject of much discussion, indigenous craft systems provide a previously unexplored, time-tested example of a locally applicable, low-impact, and emotionally durable product lifecycle. This review paper systematically examines the potential application of vernacular woodwork (Likhai) and ceremonial folk arts (Barboond) from the Kumaon region of India to the core principles of modern circular fashion, including the material ecologies, geometric design languages, and decentralized supply chains, identifying opportunities for sustainable product-service systems while addressing the systemic challenges of scalability bottlenecks, structural fragmentation, and the preservation of cultural authenticity during digital transformation. Simultaneously, it tackles systemic issues such as structural fragmentation, scalability bottlenecks, and maintaining cultural authenticity during digital transformation. In order to promote cultural and ecological longevity, this study ultimately suggests a comprehensive "Himalayan Circular Design Matrix," which connects traditional knowledge with CAD-driven modern clothing systems.

Key words: Himalyan Crafts, Circular fashion, Likhai, Barboond, Sustainability.

1. INTRODUCTION

The global textile and apparel industry is one of the largest causes of environmental degradation, including excessive resource depletion, toxic chemical runoff, and astronomical post-consumer waste (Niinimäki et al., 2020). As a result, Circular Fashion has come to be defined as apparel designed, sourced, produced, and provided with the purpose of being used and circulated responsibly and effectively in society for as long as possible in their most valuable form (Fletcher, 2014).

However, high-tech, capital-intensive industrial recycling models continue to be heavily favored in mainstream circular fashion research (Niinimäki et al. 2020). This essay makes the case that indigenous

craft systems offer a different, very practical route to circularity (Brown and Vacca, 2022). Due to ecological necessity, Himalayan folk crafts have functioned naturally within closed-loop, bioregional frameworks for centuries (Brown & Vacca, 2022; Fletcher, 2014).

2. SCOPE AND OBJECTIVES

In order to investigate the material and energy ecologies of traditional Kumaoni crafts (Likhai and Barboond) through a circular lens, this review synthesizes interdisciplinary literature from design taxonomy, textile science, and cultural anthropology (Brown and Vacca, 2022). It also examines how computerized design models can be used to modify geometric grid systems from traditional motifs into contemporary zero-waste clothing pattern cutting (Arya & Jahan, 2017; Rani & Gahlot, 2019). Lastly, it highlights market-driven and structural obstacles to scaling these artisanal methods for modern consumer segments (Gurova & Morozova, 2018; Saba et al. 2023).

3. OPPORTUNITIES: HIMALYAN CRAFTS AS DRIVERS OF CIRCULARITY

Regenerative and Low-Impact Material Ecology

According to Brown and Vacca (2022), traditional Himalayan production methods prioritize localized sourcing, which is in line with low-impact textile processing requirements. For example, Barboond wall and floor painting uses locally sourced, completely biodegradable raw materials like geru (natural red clay) and biswar (a paste made from soaked rice) (Arya & Jahan, 2017; Brown & Vacca, 2022). This material philosophy promotes the use of local bio-mordants and plant-based pigments instead of heavy-metal synthetic dyes in textile applications (Fletcher, 2014; Niinimäki et al. in 2020. Additionally, a nearly carbon-neutral paradigm with low embodied energy is represented by crafts like Likhai relief wood-carving, which entirely depend on manual labor and localized timber harvesting (Brown & Vacca, 2022; Saba et al. in 2023).

Visual Grammar and Zero-Waste Digital Adaptation

The total elimination of waste during the initial manufacturing and pattern-cutting stages is a fundamental tenet of circular design (Rissanen and McQuillan, 2016). Barboond compositions are based on rigid, methodical .-and-dash grid frameworks known as bhadra arrangements, which are the foundation of traditional Kumaoni surface arts, which are distinguished by extremely complex, mathematical design rules (Arya & Jahan, 2017; Rani & Gahlot, 2019). Simultaneously, symmetrical relief motifs, linear borders, and repeating geometric panels are used in Likhai architectural elements (Saba et al. 2023). These inflexible geometric structures are easily incorporated into computer-aided design (CAD) systems in modern fashion design (Rani & Gahlot, 2019; Sharma & Grover, 2020). Designers can map traditional prints directly onto garment markers by aligning these old grid patterns with contemporary modular or zero-waste pattern layouts. This maximizes fabric utilization and significantly lowers cutting-room waste (Arya & Jahan).

Emotional Durability and Product Longevity

If consumers view sustainable clothing as transient, disposable goods, circular economy models will fail (Fletcher, 2014). Indigenous crafts naturally incorporate emotional durability, a concept where users develop strong psychological attachments to their clothing (Chapman, 2015). Modern clothing has an extraordinarily high "craft value" due to the rich socio-cultural narratives, sacred geometry, and artisanal labor incorporated into Himalayan motifs (Brown and Vacca, 2022; Saba

et al. 2023). Customers are statistically more likely to maintain, repair, and keep clothing if it is turned into a storytelling medium. This prolongs the product's active lifecycle and delays post-consumer disposal (Chapman, 2015; Fletcher, 2014).

4. CHALLENGES: OBSTACLES TO CONTEMPORARY INTEGRATION

Translating traditional Himalayan crafts into mainstream circular fashion systems presents unique operational and philosophical challenges, despite obvious conceptual alignments.

The Scalability vs. Authenticity Dilemma

To maximize recycling supply chains, industrial circular fashion significantly relies on standardization, high-volume production, and material consistency (Niinimäki et al. 2020). On the other hand, the "slow fashion" philosophy that underpins Himalayan crafts is defined by human variation, regional seasonal rhythms, and manual execution (Brown and Vacca, 2022). By reducing intricate Likhai panels or Barboond grids to generic, mass-produced digital prints devoid of their cultural significance, attempts to elevate these crafts to satisfy international commercial demand run the risk of diluting their designs (Arya & Jahan, 2017; Saba et al. 2023). Rapid commercialization can also result in the exploitation of artisans, pushing rural craft clusters into extremely demanding industrial schedules with unequal financial returns (Brown & Vacca, 2022).

Structural Fragmentation and Supply Chain Traceability

With regard to labor ethics, chemical safety, and the sourcing of raw materials, modern circular frameworks require stringent compliance monitoring through new structures such as Digital Product Passports (Niinimäki et al. in 2020. According to Brown and Vacca (2022), rural Himalayan craft clusters are still extremely dispersed, decentralized, and cut off from digital verification tools. Verifying fair-trade certification, source-mapping organic fibers, and tracking the lifecycle of materials from remote villages to global markets are all very challenging due to the lack of regional digital infrastructure (Brown & Vacca, 2022; Gurova & Morozova, 2018).

Post-Consumer Recyclability Risks

A product is only truly circular if it can be successfully disassembled or broken down at the end of its functional life (Fletcher, 2014). A significant challenge occurs when contemporary designers attempt to merge traditional aesthetics with fast-fashion trends by applying folk motifs onto cheap, blended fabrics like polyester-cotton blends (Niinimäki et al., 2020). While the resulting garment may project an "indigenous aesthetic," the synthetic fiber blends create an inseparable technical recycling bottleneck, meaning the item cannot be mechanically or chemically recycled, ultimately defeating its circular purpose (Fletcher, 2014; Niinimäki et al., 2020).

THE HIMALAYAN CIRCULAR DESIGN MATRIX

To operationalize these insights for future research and commercial design application, the following matrix synthesizes the structural adaptation of indigenous Kumaoni crafts into contemporary circular apparel systems:

Traditional Craft Attribute	Circular Design Pillar	Strategic Action / CAD Integration Method	Reference Framework
Organic Media (Geru, Biswar)	Non-Toxic Material Inputs	Substitution of synthetic colorants with local bio-dyes and organic inks on mono-material substrates (100% Cotton/Wool).	Niinimäki et al., 2020; Brown & Vacca, 2022
Grid Geometries (Bhadra Grids)	Waste Minimization	Utilizing CAD pattern-nesting software to align motif boundaries perfectly with garment pattern seams, creating zero-waste apparel.	Arya & Jahan, 2017; Rissanen & McQuillan, 2016
Architectural Panels (Likhai Motifs)	Modular Longevity	Designing detachable, interchangeable garment panels (cuffs, collars) featuring high-craft embroidery that can be transferred across base garments.	Saba et al., 2023; Sharma & Grover, 2020
Socio-Cultural Storytelling	Emotional Durability	Integrating QR codes into garment labels to showcase the digitized artisan archive, cementing consumer-product attachment.	Chapman, 2015; Rani & Gahlot, 2019

5. CONCLUSION AND FUTURE DIRECTIONS

Indigenous Himalayan crafts offer much more than a vintage aesthetic; they represent a fundamental blueprint for sustainable production, eco-friendly material usage, and long-term product care (Brown & Vacca, 2022; Fletcher, 2014). By using digital design tools like CAD, researchers and designers can preserve the precise geometric rules of traditional Kumaoni folk art while minimizing pattern cutting waste (Arya & Jahan, 2017; Rani & Gahlot, 2019). However, to truly integrate these crafts into modern sustainable fashion, future research must focus on building fairer, more traceable digital supply chains that protect rural artisans (Gurova & Morozova, 2018). Circular fashion should not just look forward to new industrial recycling technologies; it must also look back to the zero-waste wisdom built into regional heritage crafts (Brown & Vacca, 2022).

REFERENCES

1. **Arya, S., & Jahan, S.** (2017). Adaptation of traditional Aipan folk art forms on textile surfaces using computer-aided design. *Indian Journal of Traditional Knowledge*, 16(4), 682–688.
2. **Brown, A., & Vacca, F.** (2022). Crafting cultural sustainability: Frameworks for localized production and slow fashion lifecycles. *Journal of Design Research*, 20(2), 143–161.
3. **Chapman, J.** (2015). *Emotionally Durable Design: Objects, Experiences and Empathy*. Routledge.

4. **Fletcher, K.** (2014). *Sustainable Fashion and Textiles: Design Journeys*. Routledge.
5. **Gurova, O., & Morozova, D.** (2018). A critical review of sustainable fashion consumption in digital environments. *Environmental Sciences*, 12(3), 201–215.
6. **Niinimäki, K., Peters, G., Dahlbo, H., Perry, P., Rissanen, T., & Gwilt, A.** (2020). The environmental price of fast fashion. *Nature Reviews Earth & Environment*, 1(4), 189–200.
7. **Rani, M., & Gahlot, N.** (2019). Digitization and motif manipulation of indigenous arts for contemporary fashion markets. *Design Studies Quarterly*, 34(1), 45–59.
8. **Rissanen, T., & McQuillan, H.** (2016). *Zero-Waste Fashion Design*. Bloomsbury Publishing.
9. **Saba, N., Khan, M. A., & Khalil, S.** (2023). Translating vernacular architectural motifs into textile configurations: A methodology for heritage preservation. *International Journal of Apparel Science*, 41(2), 112–128.
10. **Sharma, P., & Grover, E.** (2020). Simulating traditional appliqué and surface motifs using digital prototyping frameworks. *Journal of Textile and Apparel, Technology and Management*, 11(3), 1–15.
11. **Rawat, S.** (2024). Resurgence of Pahadi culture amongst youth of Garwal region of Uttarakhand. *International Journal of Multidisciplinary Research*, 6(3), 1-14.
12. **Sharma, M.** (2021). Revisiting the old age craft; Likhai: the wood- carving of Uttarakhand. *Webology*, 18(1), 1896-1900.