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Timeless Versatility: A Reversible Necklace from Scrap Wood and Embellished Materials

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***Abstract*— The fashion jewellery industry contributes to resource depletion and waste through the continuous production of single-purpose accessories. Sustainable design approaches that extend product utility and make productive use of waste materials can contribute to more responsible consumption. This paper presents "Timeless Versatility", a reversible necklace primarily crafted from scrap wood generated during furniture manufacturing and combined with selected stone and fabric embellishments. Designed for a professional model, one side of the necklace provides a bold and glamorous aesthetic suitable for runway shows, while the reverse side offers a refined, textured appearance for evening wear. Inspired by the peacock (*Pavo cristatus*), the design translates the bird's layered plumage, iridescent colours, and natural elegance into a contemporary accessory. A user-centred design process involving customer research, concept development, material exploration, feasibility assessment, and iterative prototyping was followed. Handcrafted techniques including wood shaping, surface finishing, stone setting, beadwork, and embroidery were employed. Reversible construction enables one product to serve two styling requirements, potentially reducing the need for multiple accessories. The final prototype demonstrated the feasibility of integrating scrap wood with embellished materials to create a multifunctional fashion accessory. Initial client feedback supported the aesthetic and functional suitability of the prototype, while the study also identifies the need for further user testing, formal durability assessment, and environmental impact comparison. The study demonstrates a design-based approach to giving additional value to furniture-manufacturing wood residues through contemporary jewellery development.**

Keywords: Sustainable jewellery, Scrap wood, Reversible design, Upcycling, Fashion accessory

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I. INTRODUCTION

The fashion industry is associated with substantial resource consumption, overproduction, and waste generation. Within fashion accessories, single-purpose products can limit product versatility and may encourage the acquisition of multiple items for different occasions. Sustainable design approaches increasingly emphasise product longevity, reuse, multifunctionality, and the productive utilisation of waste materials. Research on sustainable jewellery similarly highlights the importance of considering material selection, waste recovery, circularity, and end-of-life possibilities in jewellery design (Tenuta et al., 2024; Li & Yu, 2025; Canaan & Guerra, 2026).

The use of waste materials in jewellery can provide opportunities for both material recovery and design innovation. Tenuta et al. (2024), for example, identify the reshaping of waste and the use of natural and recovered materials as important directions for sustainable jewellery design. Recent research also emphasises the importance of considering repairability, reuse, disassembly, and recycling as part of sustainable jewellery development rather than focusing only on the material used in the initial product (Jiang et al., 2025).

Wood waste provides a relevant material stream for such applications. In Sri Lanka, the Moratuwa Woodworking Industry Cluster comprises more than 1,600 small- and medium-scale wood-based manufacturing and retail facilities, including furniture manufacturers, carpentry shops, sawmills, and integrated sawmills (Himandi et al., 2021). A study of the Moratuwa woodworking industry reported approximately 6,489.879 tonnes of wood waste generated per month across the studied woodworking industries, with sawdust accounting for 76.5%, wanes for 16.5%, and offcuts for 6.9% of the total waste stream (Himandi et al., 2020). These findings

demonstrate the availability of wood residues within a significant Sri Lankan woodworking cluster and indicate opportunities for improved material utilisation.

Scrap wood generated during furniture manufacturing may retain useful structural and aesthetic qualities even after it is no longer required for its original purpose. Previous research has identified wood-waste utilisation and value-added applications as opportunities for improving resource efficiency within woodworking industries (Daian & Ozarska, 2009; Himandi et al., 2021). Transforming selected wood residues into fashion accessories therefore represents a potential form of upcycling in which an industrial by-product is redirected into a higher-value design application.

This study presents the design and development of "Timeless Versatility", a reversible necklace primarily crafted from scrap wood obtained from furniture-manufacturing waste and enhanced with stone and fabric embellishments. The necklace was designed around the dual styling requirements of a professional model: one side provides a bold and glamorous appearance suitable for runway shows, while the reverse side offers a refined and textured aesthetic appropriate for evening wear. By integrating two distinct aesthetic expressions into a single accessory, the design explores whether multifunctionality can provide additional product utility while reducing the need for separate accessories.

The creative concept is inspired by the peacock (Pavo cristatus), particularly its layered plumage, iridescent colour variations, and natural elegance. These characteristics informed the form, colour direction, surface treatments, and material combinations of the necklace.

The project followed a user-centred design process involving customer research, trend and market analysis, concept development, material exploration, feasibility studies, and iterative prototyping. Handcrafted techniques including wood shaping, surface finishing, stone setting, beadwork, and embroidery were used to develop the final prototype.

The study therefore aims to demonstrate the feasibility of combining scrap wood from furniture manufacturing with reversible, multifunctional design to create a contemporary fashion accessory while considering both the opportunities and limitations associated with mixed-material construction.

II. LITERATURE REVIEW

A. Sustainability and Circular Approaches in Fashion Accessories

Sustainability has become an important concern within fashion due to resource consumption, waste generation, and the environmental impacts associated with production and disposal (Fletcher, 2014; Niinimäki et al., 2020). While sustainability research has traditionally focused strongly on apparel, jewellery and fashion accessories also provide opportunities for circular design through material recovery, reuse, multifunctionality, and extended product use.

Circular design approaches encourage designers to consider the entire life cycle of products and materials. Reuse and upcycling can retain the value of existing materials, while multifunctional design can increase the utility of a product without requiring the production of multiple separate items (Chapman, 2009; Gwilt, 2014).

Recent jewellery research has specifically explored sustainable material scenarios and the transformation of waste into new design applications. Tenuta et al. (2024) identify waste reshaping, responsible material selection, natural materials, and circular strategies as important directions for sustainable jewellery design. Li and Yu (2025) similarly discuss the innovative application of sustainable materials in contemporary jewellery. Canaan and Guerra (2026) examine systemic design and circular economy approaches to transforming waste into raw materials for jewellery, while Ding (2023) demonstrates the potential for recovered materials to be incorporated into new jewellery applications.

These studies indicate that sustainable jewellery development extends beyond replacing conventional materials and requires consideration of material sourcing, design, production, use, and end-of-life pathways.

B. Upcycling of Wood Waste in Design and Craft

Wood waste generated by furniture manufacturing and related industries can include sawdust, slabs, wanes, offcuts, and other residual materials. Previous research has identified opportunities to improve the utilisation of such residues through alternative applications and industrial symbiosis (Daian & Ozarska, 2009; Himandi et al., 2021).

Wood can also provide aesthetic and functional opportunities in small-scale product and jewellery applications because of its natural grain, colour variation, workability, and relatively low weight compared with some conventional jewellery materials. The use of recovered wood can therefore combine material reuse with visual differentiation.

However, the environmental value of a wood-based accessory should not be assessed solely on the basis that wood is a natural or waste material. The use of adhesives, coatings, synthetic embellishments, and mixed materials may influence repairability, material separation, and end-of-life recovery. Sustainable jewellery design therefore requires consideration of the complete material combination and not only the primary material (Tenuta et al., 2024).

C. Multi-functional and Reversible Design Strategies

Multifunctional and reversible designs enable one product to fulfil more than one use or aesthetic requirement. Such strategies can potentially reduce the need for multiple products and extend product utility (Chapman, 2009; Gwilt, 2014). In fashion accessories, reversible or transformable products can allow users to adapt an item to different occasions while retaining the same physical product.

The effectiveness of multifunctionality depends on whether the additional functions can be integrated without compromising comfort, usability, structural performance, or aesthetic quality. Therefore, reversible jewellery needs to consider fastening, balance, material thickness, weight distribution, and ease of transformation.

D. Nature Inspired Design in Sustainable Fashion

Nature-inspired and biomimetic approaches have been widely used to generate forms, structures, textures, and conceptual narratives in design (Benyus, 2002). The peacock provides a particularly relevant source of visual inspiration because of its layered plumage, iridescent colour variations, and distinctive surface patterns.

In this project, the peacock was not reproduced literally. Instead, its layered visual qualities and colour characteristics informed the composition, surface development, and contrast between the two sides of the necklace. This approach allowed natural inspiration to be integrated with the use of recovered material.

III. PROBLEM IDENTIFICATION

Fashion accessories are frequently developed for particular styling contexts, which may encourage users to acquire multiple products for different occasions. For professional models, this can include the need for accessories with different visual effects for runway presentations and formal or evening appearances.

At the same time, furniture manufacturing generates wood residues that may have further material value. Research conducted in the Moratuwa Woodworking Industry Cluster in Sri Lanka demonstrates the scale of wood-residue generation and identifies offcuts among the generated waste materials (Himandi et al., 2020). Although a considerable proportion of woodworking residues is already utilised, the research also identifies opportunities for improving material flows and developing additional value-added applications.

In the local and regional context, there is limited availability of fashion jewellery that successfully combines upcycled materials with genuine multi-functional performance. Most sustainable jewellery initiatives focus either on material substitutions or on aesthetic innovation, but few effectively integrate waste-based materials with reversible or dual-purpose design strategies. As a result, professional users who require versatility across different fashion contexts continue to rely on conventional single use accessories.

Existing sustainable jewellery research has explored alternative materials, recovered waste materials, and circular design approaches (Tenuta et al., 2024; Li & Yu, 2025; Canaan & Guerra, 2026). However, there remains an opportunity to combine waste-based material utilisation with reversible, dual-aesthetic functionality in a single fashion accessory.

This project addresses this design opportunity by developing a reversible necklace using scrap wood from furniture manufacturing as its primary structural material, combined with selected embellishments. The design seeks to provide two distinct aesthetic expressions within one product while exploring the potential of upcycled industrial material in contemporary fashion jewellery.

IV. AIM AND OBJECTIVES

The aim of this study is to design and develop a sustainable, seasonless reversible necklace primarily crafted from scrap wood obtained as waste from furniture manufacturing and combined with selected embellishments, inspired by the peacock, to meet the dual styling requirements of runway shows and evening wear while exploring the potential of upcycled materials in contemporary fashion jewellery.

The objectives are to achieve aim of the project. Therefore, following objectives have been established:

- To study sustainable fashion accessory developments and the necklace preparation process, materials, and equipment in relation to selected customer requirements.
- To investigate the suitability of scrap wood generated during furniture manufacturing as a primary material for sustainable fashion jewellery.
- To develop a reversible necklace design that provides two distinct aesthetic expressions: a bold and glamorous appearance suitable for runway shows and a refined, textured appearance suitable for evening wear.
- To apply handcrafted techniques including wood shaping, surface finishing, stone setting, beadwork, and embroidery in the construction of the necklace.
- To evaluate the functionality, comfort, balance, fastening security, and aesthetic quality of the final prototype through iterative development and client feedback.
- To explore how multifunctional design combined with upcycled materials can contribute to more sustainable practices in fashion accessory development.

V. METHODOLOGY

A. Customer Research

Primary data were collected from one professional model, who participated as the client in this design case study. A structured interview and an online survey were conducted with the same participant.

The customer research focused on identifying functional requirements, aesthetic preferences, comfort needs, material expectations, and the requirement for versatility across runway and evening occasions. The findings established the initial design criteria for the project.

As the customer research involved a single participant, the findings represent an individual design case and cannot be generalised to the wider population of professional models or jewellery users.

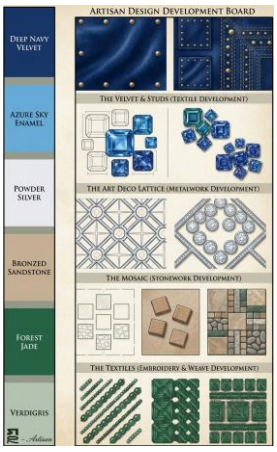
B. Market and Trend Analysis

Market analysis was conducted to examine existing sustainable jewellery products, multifunctional accessories, and design approaches involving recovered or alternative materials. Trend research for 2025/2026 focused on upcycled materials, mixed-media jewellery, multifunctional design, and contemporary accessory aesthetics.

The market and literature review findings were used as supporting information during concept development rather than as a quantitative market survey.



Figure 1. Inspiration: The Peacock (*Pavo cristatus*)



(a) (b)

Figure 2. (a) Colour palette (b) Pattern developments

C. Inspiration and Concept Development

Visual research was undertaken on the peacock (*Pavo cristatus*) (Figure 1), examining its layered plumage, iridescent colours, textures, and structural forms. These observations were translated into mood boards, colour palettes, pattern developments, concept boards, and initial design sketches under the creative concept "Dual Radiance" (Figure 3).

The design development process aimed to combine the visual characteristics of the peacock with the functional requirement for two distinct aesthetic expressions.

D. Material Exploration and Selection

Lunumidella (*Melia dubia*) scrap wood obtained from furniture manufacturing was selected as the primary structural material. Available wood offcuts were examined for structural suitability, workability, approximate weight, surface quality, grain and colour, suitability for shaping and finishing, and aesthetic potential. Complementary materials included rhinestones, fabric, beads, and embroidery thread. The compatibility of the embellishment materials with the wood structure was considered during prototype development.



Figure 3. Concept Board



Figure 4. Mood Board

E. Design Development and Feasibility Studies

Three alternative design concepts were generated and evaluated according to:

- Sustainability
- Dual functionality
- Aesthetic quality
- Technical feasibility and
- Client preference.

The final concept was selected based on its overall performance against these criteria. The three concepts were compared qualitatively against sustainability, dual functionality, aesthetic quality, technical

feasibility, and client preference. The final concept was selected based on the overall assessment of these criteria rather than a numerical scoring system.

Feasibility studies and practical experiments were conducted to examine wood shaping, surface finishing, reversible joining, stone setting, beadwork, and embroidery techniques.

F. Prototype Construction

The selected design was developed into a physical prototype using handcrafted techniques. These included shaping and finishing the scrap wood structure, applying stone embellishments to one side, and developing fabric embellishment with beadwork and embroidery on the reverse side.

The reversible mechanism consisted of rotational construction, enabling the two surfaces to be presented according to the intended styling requirement.

Client feedback was incorporated during the prototyping process to refine weight balance, fastening security, comfort, embellishment attachment, and visual harmony.

G. Prototype Evaluation

The final prototype was evaluated primarily through design observation and client feedback. The following characteristics were considered:

- Balance: assessed through wearing of the prototype and observation of weight distribution.
- Comfort: assessed through client feedback during prototype use.
- Fastening security: assessed through observation of the fastening mechanism during use.
- Reversibility: assessed through the ease of changing between the two intended surfaces.
- Aesthetic quality: assessed through visual evaluation of the two completed sides and client response.
- Sustainability: considered qualitatively based on the use of scrap wood, multifunctionality, material utilisation, and the material combination.

Because the project involved a single client and did not include laboratory-based material or durability testing, the evaluation represents an initial prototype assessment rather than a statistically generalisable performance evaluation.

VI. RESULT AND DISCUSSION

A. Customer Requirements

The customer research identified the requirement for a versatile accessory capable of transitioning between high-impact runway presentations and refined evening occasions. The key requirements included bold visual impact under stage lighting, an elegant appearance for formal settings, comfort during extended wear, manageable weight, and secure fastening.

These requirements informed the development of the reversible concept and provided the basis for evaluating the three design alternatives.

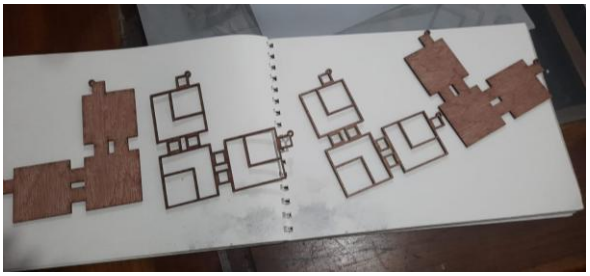


Figure 5. Wood components after cutting and shaping



(a) (b)



(c)

Figure 6. Stages of necklace preparation and assembly: (a) Embroidery design setting on fabric, (b) Back panel preparation (c) Developed all required parts before set as a necklace.

B. Concept Development and Selection

Three alternative necklace concepts were developed based on the identified customer requirements, the inspiration derived from the peacock, and the potential for incorporating scrap wood and embellished materials. The concepts explored different arrangements of the wooden components, embellishment techniques, and possibilities for achieving two distinct appearances through reversible use.

The three concepts were compared through a qualitative selection process rather than numerical scoring. Each concept was reviewed in relation to sustainability, dual functionality, aesthetic quality, technical feasibility, suitability for the selected customer, and the potential to achieve the intended reversible effect. The comparison considered the strengths and practical limitations of each concept during the design-development stage.

Based on this qualitative assessment, the concept that provided the most suitable balance between aesthetic appeal, reversible functionality, material

suitability, and technical feasibility was selected for further development. The selected concept was then refined through material exploration and iterative prototyping, with consideration given to weight balance, comfort, secure attachment of embellishments, and the visual appearance of both sides of the necklace.

C. Transformation of Scrap Wood into the Necklace

Scrap wood obtained from furniture manufacturing was selected as the primary structural material. The selected pieces were examined, marked, and cut into the required shapes according to the technical drawings. The wood components were subsequently sanded, shaped, and surface-finished.

These stages transformed the original furniture-manufacturing residue into components suitable for a fashion accessory. The process demonstrates the potential of upcycling to redirect selected industrial residues into a new product category.



(a) (b)

Figure 7. Technical drawing of the final reversible necklace design: (a) Front look of the design (b) Back look of the design

Stones were used on one side to create the bold and glamorous visual expression, while fabric, beadwork, and embroidery were used on the reverse side to create a refined and textured appearance.

D. Final Prototype

The completed prototype provided two distinct visual expressions within a single necklace. The stone-embellished side produced a bold and glamorous appearance intended for runway presentations, while the fabric-embellished side provided a refined and textured appearance intended for evening wear.

The reversible construction allowed the user to change between the two visual expressions without requiring a second necklace.

The prototype was evaluated by the client in terms of balance, comfort, fastening security, and visual suitability. During the development process, the client identified a visual imbalance in the placement of the design elements, as well as frequent rotation of the chain component of the necklace. Based on these observations, refinements were made to the placement of the design elements. In particular, the embroidery and wooden cubes were adjusted to ensure uniformity in size and precise alignment within the overall design.

The final prototype therefore represents an initial successful demonstration of the design concept rather than a comprehensive validation of long-term performance.



(a) (b)

Figure 8. Final 1:1 scale model of the reversible necklace displayed on a figure-scaled top dummy: (a) Front view; (b) Back view.

Client feedback during development identified the need for improved weight balance and secure attachment of embellishments. These issues were addressed through refinements in wood thickness, surface finishing, and fixing methods.

The final client response indicated satisfactory regarding comfort, balance, appearance, reversibility, and functionality.

Because only one client participated, these findings should be interpreted as case-specific feedback rather than representative consumer evidence.

F. Sustainability Implications

The design combines two sustainability-oriented strategies: the utilisation of a waste-derived material and multifunctional product development.

The use of scrap wood provides an alternative pathway for selected furniture-manufacturing residues. This is particularly relevant in the Sri Lankan context, where research on the Moratuwa woodworking cluster has documented substantial quantities of wood residues and identified opportunities for increased utilisation and value-added applications (Himandi et al., 2020; Himandi et al., 2021).

The reversible construction also increases the functional versatility of the product by allowing two intended aesthetic expressions within one accessory. However, this should not automatically be interpreted as a quantified reduction in environmental impact. A proper environmental comparison would require assessment of factors such as material quantities, processing energy, adhesive use, product lifespan, and

end-of-life treatment.

G. Sustainability Considerations of Mixed Materials

Although scrap wood provides an opportunity for waste utilisation, the necklace incorporates additional materials, including stones, fabric, beads, embroidery thread, adhesives, and surface-finishing materials. The combination of these materials may create challenges at the end of the product's life, particularly where permanent embellishments and adhesives make disassembly, repair, component recovery, and recycling more difficult. Sustainable jewellery design should therefore consider circularity through disassembly, repair, reuse, and material recovery (Tenuta et al., 2024; Jiang et al., 2025).

Accordingly, the environmental value of the present necklace is considered primarily as a design exploration of waste-material utilisation and multifunctionality rather than as a verified life-cycle environmental improvement.

F. Limitations

This study has several limitations. First, the customer research involved only one professional model, meaning that the findings represent a single design case and cannot be generalised to the wider population of professional models or jewellery users.

Second, the prototype evaluation was primarily based on design observation and client feedback. Formal laboratory-based durability testing was not conducted to quantify fastening strength, structural endurance, or resistance of the embellishments during repeated use.

Third, the study did not conduct a quantitative environmental impact assessment or life-cycle assessment. Consequently, the environmental benefits of the prototype cannot be expressed as a quantified reduction in environmental impact.

Finally, the use of mixed materials may create challenges related to repairability, disassembly, material separation, and end-of-life recycling. These issues should be addressed in future iterations of the design.

VII. CONCLUSIONS AND RECOMMENDATIONS

This study successfully developed "Timeless Versatility", a seasonless reversible necklace primarily constructed from scrap wood generated during furniture manufacturing and inspired by the peacock. The project demonstrated the feasibility of transforming selected wood residues into a contemporary fashion accessory through material selection, handcrafted construction, surface development, and reversible design.

The completed prototype provides two distinct aesthetic expressions within a single product. The stone-embellished side provides a bold and glamorous appearance suitable for runway presentations, while the fabric-embellished side provides a refined and textured appearance suitable for evening wear. The reversible approach therefore provides additional styling versatility within one accessory.

The project also demonstrates the potential of combining waste-material utilisation with multifunctional design. However, the findings should be interpreted as an initial prototype evaluation rather than as evidence of a quantified environmental benefit or fully validated long-term durability. The single-client research design and absence of comprehensive environmental and durability testing limit the generalisability of the findings.

Future research should involve a larger number of users to evaluate comfort, balance, aesthetic preference, fastening security, and functionality across different users. Controlled durability testing should be conducted to assess structural stability and embellishment attachment during repeated use. A comparative environmental assessment or life-cycle assessment comparing the reversible scrap-wood necklace with a conventionally produced fashion accessory would also help establish its environmental advantages and limitations. Further development could explore detachable embellishments, modular construction, and material-separation strategies to improve repairability and end-of-life recovery.

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