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Research on upcycling of used clothes based on collaborative design

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Abstract

Although the rapid development of the fashion industry has brought substantial economic benefits, it has also had severe negative impacts on the environment and society. This research provides a collaborative solution for the sustainable fashion industry by building a technology-driven and highly user-involved collaboration platform for upcycling used clothing that reduces the demand for new textile production and environmental burdens while providing a foundation for future sustainable fashion.

Keywords

Collaborative Design, Recycling of Old Clothes.

1. Introduction

Refurbishment of secondhand clothing is a powerful tool to promote sustainable development. It solves critical environmental issues by reducing waste and conserving resources. For example, producing a new T-shirt requires 2,700 litres of water. This waste can be reduced by renovating old clothes, effectively reducing the fashion industry's environmental footprint. It has also brought significant economic and social benefits. Making the fashion industry more sustainable and responsible ultimately contributes to the planet's and humanity's well-being.

2. Three strategies for optimising the upcycling of used clothes

In the book “Fashion and Sustainability”, Fletcher and Grose define upcycling as “adding value through thoughtful recycling”. Old or discarded materials are repurposed to make new, high-quality fashion items. This sustainable practice differs from traditional recycling because it adds value to discarded materials.

The upcycling process relies on collecting waste and second-hand clothing. However, ensuring the quality and hygiene of these items is complex and requires extensive washing and screening. Upcycling is more complicated than traditional manufacturing procedures and demands additional workforce and material resources, leading to increased costs and reduced market competitiveness. Designers also face the challenge of balancing creative design with market demand. Additionally, consumer interest in environmentally friendly products is growing, but they need a better understanding of the specific concepts and advantages of upcycling, which impacts the industry's development.

Based on the literature study and the case analysis, some ideas for solving the above problems are proposed.

(1) Increase consumer participation

Encourage consumers to use their old clothes for upcycling. Their own used clothes reduce the procedure of recycling used clothes, reduce the consumption of workforce and material resources, and put more resources into the design and production process. Its quality and cleanliness are often more guaranteed than used clothes collected from public collection points.

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Story-driven upcycling can be enhanced by using consumers' clothes, a design approach that creates a unique design and gives customers a deep emotional connection to the product.

(2) Technological Innovation

Technological innovation can optimise the upgrading and reengineering process and promote the upcycling project more efficiently. For example, inventory backlogs and waste can be avoided by analysing consumer buying behaviour through big data and predicting fashion trends. Virtual design software enables designers to design and modify garments in a virtual environment, reducing the need for physical samples, material wastage, and production costs and allowing the consumers to be more intuitively and conveniently informed of the progress of the transformation.

(3) Establish an online platform

Establish an online platform to provide consumers with detailed tutorials, videos, and guides, teach consumers how to perform simple clothing transformation and repair, help users improve themselves, and fundamentally enhance users' sustainable awareness. Online platforms also encourage consumers to share and inspire other users' inspiration and confidence by showing users successful transformation projects.

3. The characteristics of Collaborative design

"Understanding collaborative design" suggests that co-design is the process by which participants from different disciplines share their knowledge about the design process and content. They do this to build a shared understanding in both, to be able to integrate and explore their knowledge, and to achieve a greater common goal: designing new products.

(1) User participation is an important feature of co-design

Customers define and deliver higher value, creating a rich and meaningful experience. This breaks the cycle of passive clothing purchases and creates clothing they feel emotionally attached to, thus integrating consumers into the value creation chain. User participation is crucial for collaborative design, directly impacting user satisfaction. Incorporating user input and needs at all stages of the design process ensures that the designed product meets the actual needs and expectations of the users. User-centred design is essential in complex projects because it effectively combines the expertise of different disciplines and allows them to reach a consensus more quickly.

(2) Co-design involves interdisciplinary collaboration

Collaborative design usually involves experts from different disciplinary backgrounds, and such interdisciplinary collaboration can bring diverse perspectives and expertise to enhance the innovation and comprehensiveness of the design. Multiple perspectives offer multiple possibilities for the design process. There are three main perspectives.

1. Ideas: A team can generate many ideas.

2. Questions: Different people will ask broader questions to help stimulate and validate ideas.

3. Constraints: Different people will have different perspectives on the constraints of the design challenge, resulting in other ideas and criticisms of the design.

Multiplayer teams provide countless opportunities to improve design ideas - there are more brains to evaluate, question, articulate, and contribute. In many areas of design, the products and outcomes are so complex that more than one person can have enough knowledge to do it all.

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4. The application of co-design in upcycling used clothes

Upcycling old clothes through the use of co-design methods can increase consumer engagement, and encouraging them to use their old clothes for upcycling not only reduces the procedures and human and material resources consumed in recycling old clothes but also enhances their sense of participation and emotional connection. Secondly, in the context of Industry 4.0, technological innovation brings new opportunities for sustainable fashion. The innovation of collaborative tools such as AI tools can further improve the mechanism of collaborative design for upcycling old clothes.

Based on the framework of applying collaborative design methods to upcycling old clothes, I propose an innovative platform solution. The platform aims to integrate designers and consumers with sustainable consumption intentions through collaborative design, extend clothing life, and turn old clothes into new fashion items through upcycling.

1. Create basic user information:

When the platform starts to be used, a database containing user information is created to record the old clothing information and design preferences uploaded by users.

2. Information upload and collection:

Users upload photos and stories of old clothes and fill out preference questionnaires. The platform uses artificial intelligence to analyse the degree of damage to old clothes and consumer preferences, and it provides designers with detailed user information.

3. Matching users with designers:

The platform collects designers' previous transformation cases and displays them in the community. Consumers and designers make two-way choices to ensure the matching of users and designers. Detailed information can be obtained after the two parties match to achieve an in-depth understanding.

4. Pre-design:

Based on the AI analysis results, the designer recommends the transformation level, and the user confirms or re-recommends.The designer creates a design style board based on the AI analysis preferences, and users vote to determine their favourite transformation style.

5. Start designing:

After confirming the design style, the designer uses AI generation tools to refine the design plan, including shape, fabric, colour/pattern, and other decorations. All plans are displayed in the form of visual pictures. The platform provides collaborative functions, including voting, text feedback, and confirmation, to ensure that users and designers interact efficiently throughout the design process. Users vote to select design plans and finally confirm the detailed renovation plan.

6. Secondary design round:

Designers create design sketches based on user feedback and use AI 3D rendering tools to create 3D models of transformation effects. Users confirm or deny and provide modification suggestions. After the user confirms, the final design plan is confirmed.

7. Confirmation and production:

After the user confirms the final design, the platform provides design drawings, or the user mails the old clothes to the platform and delivers them to the platform's cooperative tailors for production. Through the above functions and architectural design, the platform not only realises the upcycling of old clothes and promotes the development of sustainable fashion but also enhances the interaction and cooperation between users and designers, providing a technology-driven and highly user-engaged innovative design platform.

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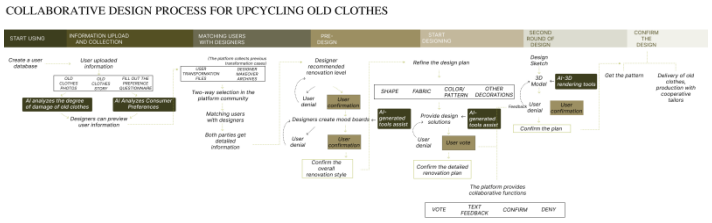

5. Conclusion

This study aims to explore the potential of upcycling old clothes to promote the development of sustainable fashion and design an upcycling platform for old clothes that combines collaborative design methods and AI technology. It aims to encourage the development of sustainable fashion with the help of innovative solutions, reduce the fashion industry's negative impact on the environment, and advocate green consumption among consumers. However, due to time constraints, this study has some limitations. There needs to be more prototype testing. The design and function of the platform are only in the theoretical and conceptual stages, and actual prototype testing still needs to be carried out. Lack of user testing and actual application data cannot verify the effectiveness and feasibility of the platform in actual use.

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