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# Design and Development of a Dual-Function Quilted Garment Using Textile Upcycling

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**Abstract -** The growing environmental burden caused by waste textiles has triggered a significant demand for sustainable clothing solutions. This paper explores the issue of designing and developing an innovative double-use quilted garment from upcycled textiles. The proposed garment can be used both as a quilted jacket and a quilted mat for travel, camping, and trekking. For the development of the garment, recycled polyester, nylon and fibre materials have been selected. These materials have been chosen based on their sustainability, recyclability and insulating capabilities. The development process included material selection, design planning, construction through quilting techniques and incorporation of the conversion mechanism with the help of zippers, Velcro and buttons. The obtained results show a good level of insulation, convenience and ease of transformation into another functional type of clothing. In conclusion, this research demonstrates the possibility of producing useful and practical clothing from upcycled materials that promotes eco-friendly and circular fashion.

***Key Words:*** *Textile Upcycling, Sustainable Fashion, Quilted Garment, Multifunctional Clothing, Circular Fashion, Textile Waste Management, Eco-friendly Design, Outdoor Apparel, Product Development, Functional Textiles*

## 1.INTRODUCTION

### 1.1 Background

At present, the fashion industry experiences a significant transformation in its approach towards sustainability and waste reduction. As textile production is expanding rapidly, the quantity of textile waste has increased significantly despite the availability of materials for reuse in the garment industry. This calls for innovative strategies of decreasing the environmental burden through the reuse of textile products. Another aspect of modern fashion concerns the desire of consumers to buy practical clothing for active life and various activities. Traveling, camping and trekking are becoming increasingly popular and require the availability of comfortable and useful products. Unfortunately, the majority of clothing products on the market is only useful in one condition, so a consumer requires purchasing two different types of items to cover all possible needs during outdoor activities. In turn, this creates problems related to the number of products purchased and their usage. At the same time, it may be considered reasonable to make the products more flexible and multifunctional to enhance their practicality and decrease waste generation. Upcycling may be regarded as a solution to this problem since upcycled products retain some of their properties. This research explores the designing and developing process of an item intended to perform both functions – jacket and convertible mat. In other words, the aim is to create an object that would unite comfort and sustainability in one product. With the help of upcycling technique, the researcher shows how used textile pieces could be recycled and used to create a comfortable garment in accordance with modern trends.

### 1.2 Problem Statement

The growing amount of textile waste and the inability to reuse it in any way may be considered critical problems for the fashion industry. Apart from that, the majority of garments are designed to perform one function only which limits their versatility. As a rule, when going out, people have to carry several pieces of clothing at once, including jackets and mats. For this reason, it is important to develop a sustainable and versatile garment utilizing textile waste.

### 1.3 Problem Definition

As follows from the previous chapter, the main problem to be solved in the current project is the lack of multifunctional garments using upcycling technique and meeting the user needs. Current garments do not include several necessary features, namely insulation and convertibility. It means that a new product should be able to play two roles – jacket and mat simultaneously.

### 1.4 Objectives

- Design a quilted garment using upcycled textile material
- Create a dual function product to be used as a jacket and a mat
- Guarantee comfort, wear resistance, and thermal insulation properties
- Make it possible to convert the product easily
- Promote sustainable fashion solutions.

### 1.5 Scope and Significance

The proposed study explores the creation of an innovative dual-use quilted item based on recycled fabrics. Specifically, the scope covers material selection, design development, construction of the quilt, and implementation of a switching mechanism making the garment suitable for use as both a jacket and a mat. The emphasis is placed on outdoor activities (traveling, camping, hiking), where portability and multi-functionality of the product matter most. Commercial aspects, weather-resistant performance, and mass production will not be included in this research.

The importance of this research lies in tackling the issues relevant to the fashion industry in relation to waste textiles and a lack of multi-functional clothes. Utilization of upcycled fabrics contributes to the implementation of sustainable principles and minimizes adverse environmental impact. At the same time, the created garment increases convenience by unifying different functions in one product, thus reducing the need for additional clothing pieces. Finally, the proposed idea is consistent with the principles of circular fashion because of the prolonged lifecycle of textile waste products.

## 2. LITERATURE SURVEY

The rising amount of textile waste generated by the fashion industry has become the main challenge prompting researchers to find sustainable ways for the reuse of discarded items, including recycling and upcycling. Existing studies show that many types of used textiles maintain reusability properties; however, problems related to inefficiencies in waste collection and processing hamper the recycling process. An increasing interest in upcycling arises because this approach allows creating more valuable products while keeping their original structure intact.

Various methods, including patchwork, quilting, and fabric reconstruction, have already been suggested for the creation of new clothes made of textile waste. Among other techniques, quilting is often used to create thermally insulated and durable clothes. Many researchers pay special attention to the problem of multi-functional clothing that can perform extra functions, especially when it comes to traveling and outdoor activities. Circular fashion has also become an important theme studied by scholars due to its environmentally friendly nature and potential economic benefits. Yet, there has been limited research on the connection between upcycling and multifunctional garment design. Thus, the present study builds upon the existing literature by incorporating the use of upcycled materials in a dual-function garment design project.

## 3. METHODOLOGY

The research employs a systematic design and development approach to create a dual-function quilted garment using upcycled textiles. The process involves various steps to achieve functionality, durability, and sustainability.

### 3.1 Market Research

In the first stage, an initial investigation explored user needs, available products, and market trends. The findings revealed that there is a need for lightweight, multifunctional, and environmentally friendly garments for outdoor activities.

### 3.2 Materials Gathering and Selection

Textile waste material, such as abandoned fabrics, recycled polyester, and reclaimed nylon, was gathered and sorted based on quality, texture, and strength. The appropriate material was selected for the exterior, interior, and insulating layers.

### 3.3 Fabric Sourcing

The selected material was prepared to ensure consistency, hygiene, and suitability.

### 3.4 Design Development

The design process began with the formulation of conceptual ideas and sketches, focusing on functionality and aesthetics. The design allowed for easy transformation from jacket to mat without compromising comfort.

### 3.5 Quilting Production

The quilting technique was used to combine the exterior layer, insulation layer, and interior layer. Appropriate stitching was used to ensure uniform padding, strength, and heat insulation.

### 3.6 Conversion System Development

An efficient conversion mechanism was created using zippers, Velcro, and snaps to allow for easy transformation between the two states.

### 3.7 Prototype Creation

A prototype was produced based on the approved design and modified as needed to enhance its functionality and usability.

### 3.8 Performance Evaluation

The prototype was tested for thermal insulation, comfort, durability, and convenience during transformation. User feedback was sought to gauge its practicality and usability.

## 4. RESULTS AND DISCUSSION

The assessment of the developed dual-function quilted garment focused on functionality, comfort, durability, and convenience during conversion. The final prototype successfully performed as both a wear and a mat, thus fulfilling the main research objective. Thermal insulation provided by the quilting construction was successful, allowing the product to become appropriate for outside wear. Using upcycled materials did not reduce the effectiveness of the product; chosen fabrics showed sufficient strength, flexibility, and comfort. Padding layer distribution was even, providing warmth as well as structural stability.

Conversion process was implemented using zippers, Velcro, and snap fasteners; therefore, it allowed a user to convert the garment without difficulty. This means that the usability of the item was high. Besides, the garment had light weight and was portable. These are important characteristics since the garment may be used during traveling and in nature.

According to users' feedback, the item was convenient and practical. The multifunctionality of the item allowed reducing the number of additional objects a person should take when going somewhere. As for sustainability, recycling of textile waste materials contributed to environmental protection.

In general, research outcomes allow stating that the designed multifunctional garment has successfully combined functionalities and sustainability. It has been proven that upcycled materials may be applied to creating products that have high value and meet consumer demands.

## 5. PERFORMANCE EVALUATION

Performance, functionality, and user acceptance of the created garment were checked through tests.

### 5.1 Thermal Insulation Test

The ability of the product to retain heat was tested. As a result, quilting with fiber filling performed well, and thus the product could be used outdoors.

### 5.2 Durability Test

Durability of the product was estimated using testing of its structure. It appeared that the garment could withstand any wear.

### 5.3 Usability and User Feedback

Tests revealed that the garment was easy to use and very convenient since it performed many functions and did not require taking other items.

## 6. CONCLUSION

This research succeeded in designing and developing a multifunctional and versatile garment that serves as both a jacket and a foldable mat. This product addresses the demand for multifunctional and portable items especially during outdoor trips.

The utilization of recycled materials shows that it is possible to transform textile waste into products that are not only functional but can even be profitable.

The tested prototype had adequate heat retention capability, durability, and transformation. It had simple and easy-to-use fasteners for transitioning from one form to another. Additionally, it was light, comfortable, and very convenient, hence suitable for traveling, camping, and trekking.

In terms of sustainability, this study makes an important contribution in decreasing the quantity of textile waste while advocating for circular fashion through innovative designs. Future research may include aspects like waterproofing, production capabilities and even commercialization of the product.

All in all, this study proved that upcycling together with multifunctional designs yield viable and sustainable solutions in apparel.


Figure 1. Pattern Layout of Jacket

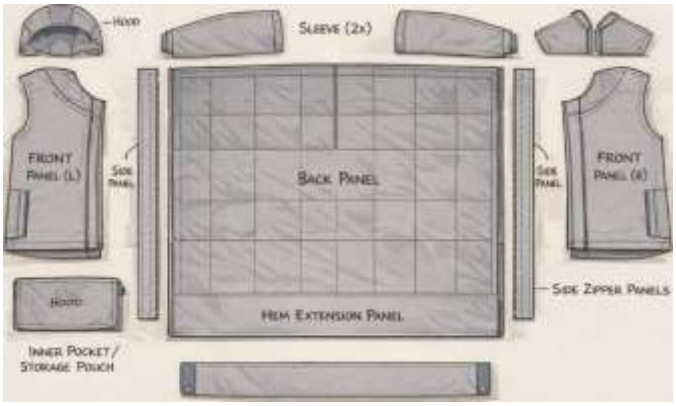


Figure 2. Back Pattern Layout of Jacket

Figure 3. Dual use Jacket

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**REFERENCES**

1. Fletcher, K. (2008). Sustainable Fashion and Textiles: Design Journeys. Earthscan, London.

2. Gwilt, A., & Rissanen, T. (2011). Shaping Sustainable Fashion: Changing the Way We Make and Use Clothes. Earthscan, London.

3. Niinimaki, K. (2013). Sustainable Fashion: New Approaches. Aalto University Publication Series, Helsinki.

4. Allwood, J.M., Laursen, S.E., de Rodriguez, C.M., & sBocken, N.M.P. (2006). Well Dressed? The Present and Future Sustainability of Clothing and Textiles in the United Kingdom. University of Cambridge Institute for Manufacturing, Cambridge.

5. Ellen MacArthur Foundation. (2017). A New Textiles Economy: Redesigning Fashion's Future. Ellen MacArthur Foundation.

6. Rissanen, T., & McQuillan, H. (2016). Zero Waste Fashion Design. Fairchild Books, New York.