

Upcycling Denim as an Eco-Friendly Fashion Solution

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ABSTRACT

The aim upcycling clothing is a sustainable strategy that reduces fabric waste. We offer upcycle by transforming used consumer denim into new clothing, thereby enhancing its elegant aesthetic value. The choice of denim as the primary material for this study stems from an understanding of the detrimental effects of textile waste on the environment and the lack of sustainable fashion practices, particularly in terms of recycling. This again offers an opportunity to reduce textile waste, save resources, and encourage awareness of sustainability in fashion. The fashion industry, constantly producing new products every season, contributes to the existence of textile waste. Upcycling, a process that transforms old clothes or textile waste into fashion products with high artistic value, is one way to reduce the environmental impact of the fashion industry. The success of this study resulted in the creation of fashion products that not only enhance their artistic value but also contribute to the growth of the fashion industry's creative sector. The purpose of this applied research on the theme of upcycling is to present practical examples of upcycling from denim and patchwork materials, aiming to create sustainable designs by repurposing unused clothing. This applied research produces a fashion collection that is not only contemporary but also sustainable, consisting of two upcycled fashion products.

Keywords: *Recycle, Denim, Industry, Fashion, Eco-Friendly*

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INTRODUCTION

The fashion industry has a major impact on the environment, with the production of new clothing often resulting in significant textile waste and carbon emissions. The fashion industry's constant creation of new products every season leads to the emergence of textile waste (Meilinda Lenawati, 2021). One approach to reducing the environmental impact of the fashion industry is to upcycle, which is the process of recycling old clothing or textile waste into aesthetic and elegant fashion products. Aus et al. (2021) elaborated on the use of upcycling as a sustainable strategy in the clothing life cycle, aiming to reduce fabric waste and enhance design techniques during the upcycle production process. Upcycling offers

opportunities to reduce textile waste, save resources, and promote awareness of sustainability in fashion (Kamble & Behera, 2021).

The decision to use denim as the primary material in this applied research stems from its environmental impact and the lack of sustainable fashion practices, particularly in terms of recycling (Cundubey & Azgin, 2024). Therefore, in this research, we have combined denim material with leftover fabric from the fashion industry. This research, by upcycling denim and fabric patchwork, not only aims to create unique and attractive products, but also strives to reduce the environmental waste that the textile industry produces. Fabric manipulation techniques like gluing, quilting, and sewing decorate upcycled fashion products (Eike et al., 2020).

The denim industry's significant environmental impact is a pressing need for sustainable alternatives in fashion. It consumes approximately 10,000 liters of water to produce a single pair of jeans, contributing to water scarcity in many regions (Gupta et al., 2022; Nayak et al., 2022; Niinimäki et al., 2020). The industry relies heavily on harmful chemicals, which pollute waterways, harm ecosystems, and pose health risks to workers and nearby communities (Bailey et al., 2022; Bosman et al., 2020; Dhir, 2021). The production of a single pair of jeans releases about 33.4 kg of CO₂ throughout its lifecycle, significantly contributing to climate change.

Upcycling denim can dramatically reduce the demand for virgin resources, including water, energy, and raw materials. This conservation is crucial in the face of growing environmental challenges. Upcycling denim can also reduce textile waste from landfills by transforming discarded denim into new products. This aligns with circular economy principles, keeping materials in use for longer and reducing the need for new production.

Research on denim upcycling can drive innovation in sustainable design, encouraging the development of new techniques and technologies that could be applied more broadly in the fashion industry. Studying and promoting upcycled denim can raise consumer awareness about sustainable fashion choices, potentially shifting consumption patterns towards more eco-friendly options. Therefore, the urgency to conduct research on upcycling denim as an eco-friendly fashion solution stems from the critical need to address the environmental challenges posed by conventional denim production. By exploring innovative upcycling techniques, we can pave the way for a more sustainable future in fashion, reducing environmental impact while promoting creativity and resource efficiency.

This research aims to provide practical examples of upcycling denim and fabric patchwork to create sustainable designs by renewing unused clothing, based on the idea that textile waste can damage the natural ecosystem. We apply an innovative approach to enhance design value by utilizing fabric manipulation techniques and crafting captivating fashion designs. The applied research entitled "Upcycling Denim as an Eco-Friendly Fashion Solution" is realized into a fashion collection that is not only contemporary but also sustainable, consisting of five upcycle fashion designs. The upcycle fashion created consists of a harmonious blend of contemporary beauty and environmental awareness, creating

garments that are not only aesthetically stunning but also pay special attention to the sustainable aspect of the fashion world.

The research "Upcycling Denim as an Eco-Friendly Fashion Solution" focuses on creating a sustainable fashion collection with five upcycle fashion designs. This approach extends the lifecycle of textiles and reduces waste, going beyond traditional recycling methods. Technological advancements in upcycling include chemical upcycling and advanced washing techniques like laser finishing and ozone washing. The upcycled denim products market is projected to grow significantly, from \$392.5 million in 2021 to \$838.6 million by 2031, with a CAGR of 7.9%. This growth presents opportunities for new business models, sustainable marketing strategies, and exploring the economic viability of large-scale denim upcycling operations.

Research in this area can combine multiple fields, such as fashion design and textile engineering, environmental science and sustainability studies, consumer behavior and marketing research, and industrial engineering and supply chain management, leading to novel insights and solutions that address the complex challenges of sustainable fashion. Quantifiable environmental benefits of upcycling include potential water savings of up to 95% compared to traditional denim production, energy savings of up to 50%, and reduction in chemical usage and its impact on ecosystems.

Investigating consumer behavior and market trends in upcycled denim products provides an opportunity to understand evolving market dynamics and compete with traditional denim in terms of style, quality, and consumer perception. Policy and regulatory implications of upcycling denim include proposing new standards for upcycled denim certification, exploring incentives for businesses to adopt denim upcycling practices, and investigating the potential for extended producer responsibility in the denim industry.

METHOD

This study used the R & D (research and development) method. Researchers used the Research and Development (R&D) method to produce specific products and assess their effectiveness. We utilized this research to create specific products, analyzing their needs and evaluating the product's effectiveness to ensure its functionality within the broader community (Sugiono, 2011). The R&D approach in this study involved an examination of design studio practices, with a specific focus on "creating fashion products through the recycling (upcycling) of fashion waste into new fashion products."

The practical method for creating this work was carried out in four stages, namely:

1. The preparation stage, where we conducted initial research observation activities to obtain data related to environmental issues and problems, was an essential initial step. The research results revealed that a primary issue was the significant amount of leftover textile fabrics or used clothing, which contributed to negative environmental impacts. In response to these findings, we committed to presenting innovative solutions through fashion upcycling, aiming to reduce the environmental impact of textile waste and promote sustainable fashion. We analyzed the field results to formulate initial ideas or concepts, which subsequently shaped the research focus. The idea of this applied

research was the design of fashion products from fashion waste or used clothing to become new fashion products.



Figure 1: Denim Waste

Source : <https://www.nexus3foundation.org/2022/09/18/sisa-sisa-limbah-pabrik-pakaian-menjadi-karya-eco-fashion-yang-unik/>

2. The design stage of a fashion product, in the form of ready-to-wear deluxe clothing, began with visualizing the idea as a sketch. The process proceeded by transforming the sketch into a working drawing, which in turn led to the visualization of a concrete prototype. In this design, it was necessary to consider several key aspects, such as performance factors to ensure product quality and durability, function factors to meet the practical needs of users, marketing factors to create appeal and marketability, and consumer interests so that the design could meet consumer expectations and desires. Four sketches were realized into upcycle fashion products.



Figure 2: Sketch 1



Figure 3: Sketch 2



Figure 4: Sketch 3



Figure 5: Sketch 4

3. Applied the concept of embodiment, analyzing a prototype model to the smallest detail to achieve the desired physical form and aesthetic elements. Subsequently, we conducted an evaluation and criticism process on the textual and contextual aspects of the embodiment. Before the realization process was carried out, the first thing to do was to prepare the tools and materials needed in the process of making the work.
 - 3.1. The embodiment tool
 - a. Measuring tape could function to take a person's body measurements or also be used to draw patterns on pattern paper.



Figure 6: Measuring Tape

- b. The embodiment tool could function to create patterns on a smaller or larger scale than the original size. This pattern ruler was used to form angular lines, such as body and center front lines, front width lines and back width lines, body and center back lines.



Figure 7: Pattern Ruler

c. Sewing machine

Mechanical or electromechanical equipment used for sewing



Figure 8: Sewing Machine

d. Fabric scissors

Used to cut fabric to be sewn



Figure 9: Fabric Scissors

3.2 Materials were items needed to make the clothes that were realized. With the equipment used in the production process and adequate materials, the sewing production process could run well. The materials needed in making the work are as follows:



Figure 10: Used Denim



Figure 11: Cotton Linen



Figure 12: Drill Cotton



Figure 13: Lining Fabric



Figure 14: Pearl Sequins

Work Process

1. Create a 1:1 pattern

The 1:1 pattern is a pattern with the body size that it should be. This pattern is realized when you are sure about the 1:4 pattern. The pattern that is realized must be exactly the same as the 1:4 pattern made previously, only the size is four times larger. The tools and materials in making this pattern are pattern paper, pencil, eraser, measuring tape, and pattern roll.

2. Cutting the material

a. Laying the pattern on the material

Place the pattern on the area of the fabric to be cut. The pattern is placed on the fabric that has been stretched in the desired fiber direction, then the pattern is pinned using pins and arranged neatly on the surface of the material. The pattern that is arranged on the surface of the material is then given a seam of around 1.5 cm - 2 cm.



Figure 15: Placing the Pattern on the Material



Figure 16: Sewing Process



Figure 17: The Process of Melting

FINDING AND DISCUSSION

RESEARCH RESULT

The fashion industry is one of the fastest-growing economic sectors and contributes significantly to the global economy. However, this growth is accompanied by various challenges, particularly those related to environmental and sustainability issues. Mass production of clothing, including denim, produces large amounts of textile waste and has a negative impact on the environment through excessive use of natural resources and pollution of water and soil. Denim, a popular textile material widely used in the manufacture of various fashion products such as jeans, jackets, and skirts, has a long life cycle but often ends up as waste due to rapidly changing fashion trends.

Every year, millions of tons of denim waste are generated, and most of it ends up in landfills, creating serious environmental problems. Therefore, the fashion industry needs innovative solutions to reduce denim waste and support sustainable practices. Implementing recycling programs, promoting upcycling, and encouraging consumers to buy second-hand items are some strategies that can help mitigate denim waste. By adopting

these practices, the industry can move towards a more sustainable future while addressing the pressing issue of textile waste.

Upcycling is one approach that can provide a solution to this problem. Upcycling is different from conventional recycling because it involves a creative process to transform used or leftover materials into new products that have higher value. This technique not only reduces waste but also creates unique and attractive products, which can increase competitiveness in the fashion market. The fabric manipulation technique creates upcycled fashions from denim. Fabric manipulation is a technique that involves various methods of processing fabrics to create new textures, patterns, and designs. We can produce innovative and high-class fashion products by applying this technique to used denim. We can apply fabric manipulation techniques such as distressing, bleaching, and dyeing.

Each of those techniques has the potential to significantly change the appearance and function of denim, giving a second chance to fabrics that were previously considered waste. This approach not only enhances the aesthetic appeal of the denim but also promotes sustainability by repurposing materials that would otherwise contribute to textile waste. By transforming used denim through these methods, we can create unique, fashionable items while minimizing environmental impact. This creative process allows for the development of distinctive pieces that reflect individual style while simultaneously addressing the pressing issue of textile waste. Ultimately, it highlights the importance of innovative practices in the fashion industry that prioritize both creativity and environmental responsibility.

The enhancement of the creative industry through upcycling and fabric manipulation is not only a solution to environmental problems but can also be a profitable economic opportunity. Consumers who care about sustainability issues often appreciate fashion products produced by upcycling for their high aesthetic value. In addition, innovation in design and production can strengthen the position of the creative industry in the increasingly competitive global market. Therefore, this study is crucial in exploring the potential of upcycling denim materials through fabric manipulation techniques, with the aim of enhancing the fashion product creative industry. By focusing on upcycling denim, the study aims to highlight how innovative fabric manipulation can not only elevate the aesthetic appeal of fashion products but also contribute to a more sustainable and economically viable creative industry. This exploration is essential for positioning the industry favorably within the global market, where sustainability is becoming increasingly important to consumers.



Figure 18: Party Dress

Through denim upcycling techniques, the Party Dress fashion design creatively explores the world of fashion, transforming used materials into new, unique, and sustainable products. We create each piece with attention to detail and aesthetics, utilizing unused denim to create a modern and environmentally friendly look. This garment combines various elements, such as the technique of gluing and sequin accents, creating a harmony between vintage and contemporary styles. The character of each item tells the story of prior denim use. Through this work, we want to convey an important message about sustainability and responsibility in the fashion industry. By upcycling denim, we not only create stylish fashion but also reduce waste and promote awareness of the importance of efficient use of resources. This work is the embodiment of limitless creativity and commitment to the environment.



Figure 19: Checked Party

Checked Party fashion creatively explores fashion through denim upcycling techniques, transforming used materials into new, unique, and sustainable products. Utilizing unused denim, each piece is created with attention to detail and aesthetics, resulting in a modern and eco-friendly look. This garment combines various elements, such as the technique of gluing and sequin accents, creating a harmony between vintage and contemporary styles. The character of each item tells the story of prior denim use. Through this work, we want to convey an important message about sustainability and responsibility in the fashion industry. By upcycling denim, we not only create stylish fashion but also reduce waste and promote awareness of the importance of efficient use of resources. This work is the embodiment of limitless creativity and commitment to the environment.



Figure 20: Checked Upcycle

This work is a creative exploration in the world of fashion through the denim upcycling technique, where used materials are transformed into new, unique and sustainable products. By utilizing unused denim, each piece is created with attention to detail and aesthetics, resulting in a modern and environmentally friendly look. This garment combines various elements, such as embellishments and rawis accents, creating harmony between vintage and contemporary styles. Each item has its own character, telling the story of the journey of denim that has served before. Through this work, we want to convey an important message about sustainability and responsibility in the fashion industry. By upcycling denim, you not only create stylish fashion, but also reduce waste and promote awareness of the importance of using resources efficiently. This work is an embodiment of unlimited creativity and commitment to the environment.



Figure 21: Smart Casual

Through denim upcycling techniques, the Party Dress fashion design creatively explores the world of fashion, transforming used materials into new, unique, and sustainable products. We create each piece with attention to detail and aesthetics, utilizing unused denim to create a modern and environmentally friendly look. This garment combines various elements, such as moldings, and broken techniques, creating harmony between vintage and contemporary styles. Each item has its own character, telling the story of the journey of denim that has served before. Through this work, we want to convey an important message about sustainability and responsibility in the fashion industry. By upcycling denim, you not only create stylish fashion, but also reduce waste and promote awareness of the importance of using resources efficiently. This work is an embodiment of unlimited creativity and commitment to the environment.

DISCUSSION

We advise fashion designers to explore various fabric manipulation techniques, such as patchwork, embroidery, and tie-dye, to find new ways to enrich upcycled denim designs. Collaboration between designers and local craftsmen who have special skills in fabric manipulation can enrich the creativity and quality of the final product. This collaboration can introduce new techniques and increase the artistic value of fashion products. It is important to market fashion products that use upcycled denim materials by emphasizing the sustainability aspect and uniqueness of the design. Educating consumers about the environmental benefits of upcycling can help increase demand and awareness of these products.

CONCLUSION

Upcycling denim with fabric manipulation techniques offers a creative solution to reduce textile waste and reuse existing materials. Fabric manipulation techniques such as cutting, re-stitching, or printing can give used denim an intriguing and unique new look. By applying fabric manipulation techniques, the resulting fashion products not only improve aesthetics but also quality and marketability.

This technique allows the creation of more dynamic and attractive designs, which can increase the appeal of products in the fashion market. This approach has the potential to increase creativity in the fashion industry by utilizing materials that are considered no longer valuable. This can trigger further innovation in fashion design and contribute to the sustainability of the industry. Upcycling denim through fabric manipulation techniques supports sustainability by reducing the need for new materials and textile waste. This contributes to environmentally friendly practices in fashion production.

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