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Exploring Sustainable Materials in Fashion Accessories Design: Eco-friendly bag Urna fanny pack

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Abstract
Growing demand for sustainable fashion has driven the development of eco-friendly materials and design methods. This study explored the use of biodegradable and recycled materials to create high-quality fashion bags. Through experiments, the researcher tested materials like recycled polyester, organic cotton, and biodegradable options, focusing on durability, appearance, and environmental impact. Results showed recycled polyester is strong and ideal for frequent use, while organic cotton offers a natural, attractive look with lower environmental impact. The study highlights how these materials can balance sustainability and function, offering useful insights for future eco-conscious fashion design and production.

Keywords: Fashion accessory; Sustainable fashion; Upcycling; Sustainable

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1.0 Introduction

Plastic, designed for durability, has paradoxically become synonymous with disposability. Despite their intended longevity, most plastic products are designed for single-use, contributing to an environmental crisis that affects ecosystems worldwide (Seto et al., 2021). Every year, approximately 11 million metric tons of plastic waste enter our oceans, posing severe threats to marine wildlife and disrupting the balance of aquatic environments (UNEP, 2021). This alarming statistic underscores the urgent need for innovative solutions that address the expansion of plastic waste.

The 2023 Waste to Wealth Innovation Design Competition, an event dedicated to the most recent fashion trends, was proudly organised by the Malaysia Design Council. This competition provides a dynamic platform for local designers to exhibit their creative innovations and concepts, emphasizing the use of discarded or refuse materials (Malaysia Design Council, 2023). Participants are encouraged to present and investigate innovative methods for converting waste into valuable fashion products, highlighting the potential of repurposed materials in the design process. The Malaysia Design Council's objective is to encourage and promote sustainable practices in the fashion industry by offering this platform, thus enabling both environmental responsibility and creative excellence among Malaysian designers.

In response to this challenge, the URNA fanny pack was conceived as a creative and sustainable approach to repurposing single-use plastics. By upcycling these materials, the URNA fanny pack not only diverts waste from landfills and oceans but also transforms it

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into a functional and aesthetically pleasing product. The design incorporates plastics of various colours and shapes, symbolising the diverse and collective responsibility that all individuals share in promoting environmental sustainability. This project aligns with Sustainable Development Goal 12 (Responsible Consumption and Production), highlighting the critical role of responsible consumption and production practices in mitigating the impact of plastic waste on our planet (United Nations, 2023). This project aims to raise awareness about the importance of sustainability in design and the potential for discarded materials to be given a second life. By turning waste into art, the URNA fanny pack is a functional accessory and a powerful statement in support of preserving our environment for future generations.

2.0 Literature Review

2.1 Upcycling Fashion Using Waste Materials: A Global Perspective

In response to the fast-fashion industry's environmental impact, upcycling clothes, especially using plastic bags, has grown globally. Upcycling reduces waste and resource use by reusing materials to make high-value goods. A broader trend toward sustainability and environmental consciousness has made this method popular in fashion.

2.1.1 Environmental Impact and Necessity

The fashion industry is one of the world's biggest polluters, generating millions of tons of waste every year (Fletcher et al., 2020). More than 92 million tons of textile waste are produced each year. Much of this waste is in landfills or incinerators, contributing to pollution and greenhouse gas emissions. Plastic bags are awful for the Earth. They do not break down naturally and can stay in the environment for hundreds of years, hurting plants and animals (Thompson et al., 2019). Bell (2020) noted that making clothes from old plastic bags is one way to help solve these problems by turning trash into valuable items. This method keeps plastic waste out of landfills and reduces the need for fresh materials. For instance, fashion designers worldwide have created unique clothing, accessories, and bags from recycled plastic. These things often have unique patterns and textures, showing how creatively materials can be used.

2.1.2 Global Innovations and Examples

Upcycling fashion has become famous worldwide thanks to several innovative projects and artists. Stella McCartney's book Sustainable Fashion Design is an excellent example of this. She was one of the first designers to use eco-friendly materials in high fashion. Upcycled plastics and other recycled materials are widely used in her collections, showing that eco-friendly fashion can be both stylish and good for the world. The Fashion Revolution is a global movement that promotes eco-friendly fashion and features many designers and brands that use recycled materials. Brands like Rafael and Reformation are known for making their collections from recycled plastics and other waste materials, setting a standard for the rest of the industry. Their work helps the Earth and challenges old ideas about waste and fashion. According to Rahman et al. (2021), Bangladesh has turned used plastic bags into trendy clothes and accessories as part of its Recycling Fashion Initiative. This project has been praised worldwide for its creative approach to fashion that does not harm the environment and for its waste management.

In the same way, The Plastic Project in the Philippines works with local artisans to make new clothes from old plastic waste. This movement created jobs while helping the Earth. A critical approach to confronting the environmental challenges of the fashion industry is upcycling materials from refuse, such as plastic bags. Designers and brands are not only reducing the environmental impact of fashion but also setting a precedent for sustainability and innovation by turning waste into valuable products. As consumer demand for eco-friendly products rises, the industry's future is expected to be significantly influenced by repurposed fashion.

2.2 Fashion Upcycle in the Southeast Asia Context

The fashion industry, renowned for its substantial environmental impact, is increasingly utilising sustainable materials to mitigate its carbon footprint and encourage eco-friendly practices. Smith and Nguyen (2022) add that among these materials, upcycled plastics have emerged as a viable solution to the increasing problem of plastic waste, particularly in Southeast Asia, where plastic pollution is a pressing issue. The region, which includes Malaysia, Indonesia, the Philippines, Thailand, and Vietnam, is a significant contributor to plastic pollution and a centre for innovative fashion practices. Several Southeast Asian countries are among the top contributors to global marine plastic contamination, and the region is currently grappling with a severe plastic waste problem. Rapid urbanisation, economic growth, and insufficient waste management systems have further exacerbated the issue, resulting in substantial environmental degradation. There has been a growing trend toward sustainable practices, including the incorporation of recycled plastics into fashion design. This initiative is designed to reduce the adverse effects of plastic waste and promote a circular economy. Upcycling has become increasingly popular in the fashion industry to address environmental and social issues. This procedure involves converting waste materials into new, higher-value products. In contrast to recycling, which often degrades materials, upcycling aims to increase the value of discarded items by transforming them into functional, contemporary products. In Southeast Asia, the upcycling of plastic waste into fashion items has emerged as a creative and impactful sustainability strategy.

2.2.1 Challenges in Upcycling Plastics

While using upcycled plastics in fashion design presents numerous benefits, it also faces several challenges in Southeast Asia.

1. Scalability: Scalability is one of the primary obstacles. According to Parker and Bennett (2022), many upcycling initiatives' capacity to compete with mass-produced, conventional fashion items is constrained by their small-scale, artisanal nature. Maintaining sustainability standards while expanding these initiatives to satisfy broader market demands is a substantial challenge.
2. Consumer Awareness: Consumer awareness and acceptance are additional obstacles. Although the market for sustainable fashion is expanding, many Southeast Asian consumers remain price-sensitive and may prioritise cost over environmental considerations (Nguyen et al., 2023). It is imperative to inform consumers about the actual cost of rapid fashion and the advantages of upcycled materials to promote the adoption of sustainable practices.
3. Quality Control: Maintaining the durability and quality of goods created from recycled plastics can also prove challenging. Jenkins and Stewart (2023) noted that upcycled plastics may vary in quality, unlike virgin materials, thereby affecting the longevity and consistency of fashion products. Funding research and development is essential to improving the treatment and processing of recycled plastics.

2.2.2 The Future of Upcycled Plastics in Southeast Asian Fashion

Despite these challenges, the future of recycled plastics in Southeast Asian fashion appears promising. The fashion industry is experiencing increased support for sustainable practices as awareness of environmental issues increases globally and locally. Governments, NGOs, and private-sector actors are promoting the circular economy and investing in initiatives to upcycle plastics. Furthermore, Southeast Asia's rich tradition of resourcefulness and craftsmanship, characterised by its distinctive cultural context, serves as a robust foundation for the ongoing expansion of repurposed fashion. By integrating modern innovation with traditional techniques, Southeast Asian designers can produce culturally significant and sustainable products.

2.3 Fashion Upcycle in Malaysia

Tan and Aziz (2023) mentioned that upcycling fashion in Malaysia is a burgeoning movement that prioritises converting waste materials into high-quality, contemporary products. This movement is part of a broader global initiative to address the environmental and ethical concerns of the rapid fashion industry, which is renowned for its large environmental footprint and waste. Several Malaysian fashion businesses, such as Biji-Biji Initiative and Kloth Cares, have implemented upcycling as a fundamental principle, transforming waste into distinctive fashion items. These brands typically source materials locally and transform them into apparel, bags, and accessories that are distinguished by their sustainability and creativity.

2.3.1 Cultural and Environmental Context

Malaysia, like many Southeast Asian nations, faces significant environmental challenges, particularly in waste management. The Malaysian Department of Environment (2020) reports that the country generates an estimated 38,000 tons of waste daily, with a significant proportion comprising textiles and plastics. In Malaysia, consumers and designers seek alternative fashion practices that minimise waste and environmental damage in response to the growing awareness of ecological sustainability. By creatively repurposing discarded materials into new, fashionable products, upcycling offers a solution that reduces the demand for new raw materials and minimises waste.

3.0 Method

The research will be practice-based and experimental.

1. To examine and understand the critical design components, material choices, and functional features of numerous bag prototypes, and to discover best practices and innovations that improve their usability and sustainability.
2. To discover several sustainable materials suitable for designing and manufacturing eco-friendly bags, particularly emphasising their environmental impact, durability, and aesthetic properties.
3. Design and create prototypes of eco-friendly bags made from sustainable materials, using new design techniques that blend functionality, style, and environmental responsibility.

3.1 Materials and Experimental

The experiment is constrained by the specific type of plastic bag waste generated from household trash (see Fig. 1). Upcycling involves directly heating the material using an instrument such as a clothes iron.

Fig. 1: A variety of wasted single-use plastic bags with different colours and sizes.
(Source: Mohd Ariff Habit)

3.1.1 Assorting Plastic Bag Waste

Waste sorting identifies plastic bags that can be efficiently processed using heating methods. The selected plastic bag must be thin and contain a variety of colours to facilitate colour layering. The results of the sifting process will be further processed through the cleaning process.

3.1.2 Waste Plastic Bag Cleaning Process

The collected plastic waste must first undergo a comprehensive cleaning process. This phase is intended to eliminate any remaining dirt or residue from the plastic material and ensure it is adequately prepared for subsequent processing. The cleaning procedure is comprised of the following steps:

1.Initial rinse: the plastic waste is rinsed with water to eliminate loose dirt or residue.
2.Soaking: The plastic is immersed in a cleaning solution to dissolve and remove any tenacious residues or contaminants.
3.Scrubbing: The material is manually or mechanically cleaned afterward to ensure that all surfaces are clean and impurity-free.
4.Final Rinse: The plastic is thoroughly rinsed with clean water to remove any remaining cleaning solution or loosened grime.
5.Drying: The plastic is thoroughly dried to facilitate subsequent sorting and processing.

After the cleaning process is completed, the plastic material is separated to isolate high-quality cracked plastic suitable for processing using heating techniques.

3.1.3 Heat Fusing Process

Heat fusing is the following process: using a cloth iron at a temperature ranging from 200 to 230 degrees Celsius. A high enough temperature is required to cause the plastic bag to fuse. A sequence of heating procedures is shown below (see Figs. 2-5). Prepare the necessary equipment: a clothes iron, an ironing board, scissors, and a piece of fabric for the cover. Divide the pigmented plastic into small rectangular fragments. Take a black plastic sheet and cut it into a large base that fits the bag pattern. Layer the base with leftover net fabric, then stack small sections of colourful plastic. Finally, cover the entire arrangement with a piece of canvas fabric. Set the iron to 200-230 degrees Celsius and apply pressure until the plastic liquefies and fuses.

Fig. 2: Cut the plastic into small rectangular fragments.
(Source: Mohd Ariff Habit)

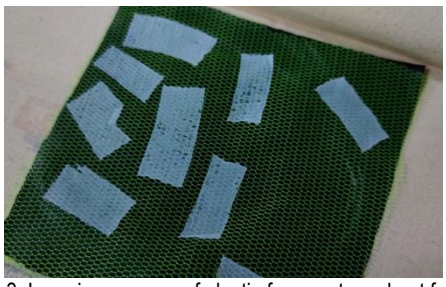

Fig. 3: Layering process of plastic fragments and net fabric remnant.
(Source: Mohd Ariff Habit)

Fig. 4: Heat pressing with a cloth iron until the plastic liquefies and fuses.
(Source: Mohd Ariff Habit)

Fig. 5: The result after layering and heat pressing.
(Source: Mohd Ariff Habit)

3.1.4 Cutting and Sewing Process

The cutting procedure is essential for transforming raw materials into components required for bag assembly. The typical operations (see Figs. 6 and 7) are as follows:

1.Pattern Construction: A comprehensive pattern or template is developed for the bag, delineating each component that requires cutting. This process guarantees that each item is consistent and adheres to the established design standards.
2.Marking: The pattern is marked on the fabric. The parts must be precisely marked to ensure they fit together seamlessly during assembly.
3.Cutting: Sharp scissors trim the material along the designated lines properly. Precision is essential to ensure that all components are the appropriate size and shape, as any errors could affect the bag's ultimate appearance and functionality.

4.Sewing: The plastic prepared for diffusion will be zigzag-stitched using a single-needle sewing machine with a stitch distance of 2.5. Reinforcing the material will increase its durability. The parts are assembled according to the design pattern using a sewing machine. The edges of the bag, where panels are joined, and the construction of compartments, zippers, and other functional elements are among the critical seams.

Fig. 6: Reinforcing the material with a zigzag stitch.
(Source: Mohd Ariff Habit)

Fig. 7: Cutting the material into all components of the bag.
(Source: Mohd Ariff Habit)

4.0 Results and Discussion

Fig. 8: Finished product Eco-Friendly Bag URNA fanny pack.
(Source: Mohd Ariff Habit)

Fig. 9: Test fit the URNA fanny pack on the model.
(Source: Mohd Ariff Habit)

Fig. 10: Receive a consolation prize in the "Waste to Wealth" competition.
(Source: Mohd Ariff Habit)

The creation of the Eco-Friendly Bag *URNA* fanny pack considered (see FFigs.8 to 10) the following aspects:

1.Shape Compact and Functional: The upcycled fanny pack is typically designed with a compact, ergonomic, comfortable shape around the waist or across the torso. Its sleek, rectangular, or slightly curved shape facilitates easy access while ensuring a secure, body-conforming fit.

2.Versatile Compartments: The shape often contains multiple compartments of varying sizes to optimise storage while sustaining an elegant look. The utilisation of upcycled materials can result in a slightly textured or asymmetrical appearance of the pack, enhancing every component's individuality.

3. Eco-Friendly Aesthetics: The design prioritises sustainability, often featuring a patchwork of colours, textures, and patterns made from upcycled materials, including discarded plastics, fabric remnants, and even old clothing. The unique appearance of each fanny pack results from this mix-and-match approach.
4. Urban and Minimalist: Although the materials are varied, the design is generally minimalist, emphasising urban style and practicality. The fanny pack is frequently equipped with secure closures, such as zippers or buckles, and adjustable straps to improve functionality and aesthetics.

5.0 Conclusion

Researching upcycled fashion is crucial for Malaysia, as it directly addresses environmental issues such as waste management, creates economic opportunities, and safeguards cultural heritage. By converting waste materials into new items, Malaysia has the potential to reduce pollution, encourage sustainable consumption, and establish itself as a leader in sustainable fashion. The upcycle designers must increase their recognition by implementing public awareness campaigns, collaborating with well-known brands, participating in fashion events, and utilising social media platforms. Enhanced visibility appeals to environmentally conscious consumers and investors, and motivates more designers to adopt sustainable practices, promoting a more environmentally friendly fashion industry in Malaysia.

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Paper Contribution to Related Field of Study

This study contributes to the field of fashion accessories design by demonstrating how sustainable materials can be effectively applied in eco-friendly bag development, offering practical insights into environmentally responsible design practices.

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