Upcycling Fabric Waste into Eid Festival Lanterns: Ecological Design in a Circular Economy Paradigm

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Abstract

This research paper presents the study and development of decorative lanterns from fabric scraps for the Eid Festival, focusing on integrating sustainable design concepts with Islamic art and culture. The research was conducted within the framework of environmentally friendly product design, combined with the study of Muslim community cultural identity.

The research process began with examining various fabric scrap properties and developing appropriate patchwork techniques, through experimentation with diverse design forms, resulting in prototypes that achieve both aesthetic appeal and functional requirements. The findings demonstrate the feasibility of developing valuable products from waste materials while maintaining craftsmanship and cultural significance.

This research proposes key future research directions, including technological development for enhanced production efficiency, digital technology application in pattern design, market research to expand environmentally conscious consumer segments, and new product development utilizing textile waste materials.

Keywords: upcycling, fabric scraps, lanterns, Eid festival, design.

1. Introduction

The textile and apparel industry ranks among the world's largest waste generators, with cutting waste accounting for up to 15% of raw materials used in production (Zhang, 2023). While demand for environmentally friendly products continues to rise (Kim et al., 2024), upcycling textile waste into value-added products presents a viable solution to this challenge.

Designing products from fabric waste is an intriguing concept, as it maximizes resource utilization and reduces environmental waste. Fabric scraps can be used to create bags, pillows, clothing, home decor, and a wide range of other products. This design approach aligns with the principles of upcycling, which emphasizes adding value to leftover materials. Upcycling design approach allowed the researcher to repurpose waste materials that would have otherwise been disposed of in landfills (Boonpracha et al., 2024). In addition to helping conserve the environment, it also generates income for communities and society.

Furthermore, repurposing fabric waste through upcycling aligns with the concept of a circular economy, which focuses on efficient resource use, reduced consumption of new

materials, and waste reduction. This approach helps mitigate environmental problems and climate change (Raihana et al., 2022).

Batik fabric plays a significant role in the culture and traditions of Muslims in Thailand, particularly in the southern region where a large Muslim population resides. Batik is commonly used in daily life, such as for clothing, headscarves, and special religious attire (Satha-Anand, 2021). Apart from being a garment, batik also serves as a symbol of cultural identity and Muslim heritage (Lateh & Mudor, 2022).

The production of batik in Thailand has its unique characteristics, influenced by the batik art of the Malay and Indonesian people. The patterns often feature geometric shapes or symbols with meanings in Islamic religion, such as stars, mosques, and flowers, while also incorporating local Thai motifs (Salaeh & Yodmani, 2020). The popularity of batik among Thai Muslims goes beyond its practical use; it also represents spiritual values and the preservation of Islamic culture. Batik is a precious cultural heritage that reflects the way of life and identity of Muslims in Thailand.

The batik fabric tailoring industry generates a significant amount of fabric waste. If these fabric scraps are repurposed through upcycling into decorative lanterns for Eid, an important Muslim festival where homes are adorned with lanterns and decorations, it presents an opportunity to create unique, culturally valuable, and environmentally friendly products while promoting local culture. According to a World Bank survey (2021), Muslims worldwide have shown increased consumption of home decor products and halal goods. The production of lanterns from batik fabric scraps is likely to meet the demands of the Muslim market, especially during Eid celebrations, which have a tradition of decorating homes and spaces with lanterns (Madjid et al., 2020). Creating products with embedded cultural stories helps build emotional value and brand engagement (Halim & Budiastuti, 2021).

1.1 Research Objectives

1. To design and develop decorative lantern products for Eid festivals using batik fabric waste
2. To create a prototype of decorative lantern products for Eid festivals
3. To evaluate the designs of decorative lantern products for Eid festivals

2. Body of paper

Research Methodology

This research employs a research and development methodology divided into four phases:

Phase 1: Preliminary Study

The preliminary study phase focuses on gathering comprehensive data in three key areas:

First, study of batik fabric waste from the garment industry, including types and properties of waste materials, quantity and sources, classification of batik waste, and development of appropriate patchwork techniques through various design experiments.

Second, investigation of decorative lighting design, focusing on lighting design principles and safety standards.

Third, consumer research examining lighting usage behavior during Eid festival and analysis of design requirements.

Phase 2: Textile Waste Transformation Technique Development

This phase focuses on two main areas of development:

First, the research explores various patchwork techniques, combining traditional craftsmanship with contemporary methods. This includes investigation of traditional Islamic textile patterns, development of modern patchwork applications and integration of various materials and techniques to create unique textures.

Second, testing includes strength assessment, heat resistance evaluation, and light transmission properties.

Phase 3: Product Design and Development

The design and development phase integrates two key components:

At the conceptual design stage, the research focuses on translating traditional Islamic geometric patterns and cultural elements into contemporary lighting design. This process involves: Developing initial design concepts through sketching and ideation, creating detailed 2D technical drawings and building 3D models to evaluate proportions and functionality.

In the prototype development stage, emphasis is placed on translating designs into viable products through: Evaluating and selecting optimal production techniques, developing systematic manufacturing procedures and producing working prototypes for further testing.

Phase 4: Product Evaluation

Product evaluation is conducted by five product design experts, assessing: beautiful patterns and colors, be unique, be contemporary and suitable for home decoration.

Each phase builds upon the findings of the previous phase, ensuring a systematic and comprehensive approach to product development that addresses both technical requirements and cultural considerations.

Research Result

This research investigates innovative product design approaches utilizing textile waste from the batik fabric tailoring industry, focusing on creating decorative lighting for Eid festivals, a significant celebration in Muslim communities. The study integrates contemporary design concepts with upcycling principles to develop products that combine functional utility with cultural aesthetics. The research results are as follow:

Analysis of Textile Waste Properties

The investigation of batik fabric waste materials revealed diverse characteristics across fabric types. The research identified specific properties essential for lighting application:

- Moderate fabric thickness for optimal light diffusion
- Appropriate level of translucency for lighting effects
- High heat resistance for safety considerations
- Suitable flexibility for manufacturing processes

Figure 1: The batik fabric waste materials

Development of Transformation Techniques

Through experimental development, innovative patchwork techniques were established:

- Multi-layer stitching technique for controlled light diffusion
- Geometric cut-work technique for pattern creation
- Three-dimensional folding and pleating for texture and form

Each technique was developed with consideration for both aesthetic appeal and functional requirements in lighting design.

Figure 2: The patchwork techniques

Product Design and Development Results

The decorative lighting products were developed with consideration for contemporary design principles and Eid festival usage requirements. The details are as follows:

Design Concept

The products were designed under the "Islamic Contemporary Lighting" concept, integrating traditional Islamic art with contemporary design principles. Islamic geometric patterns serve as the primary design elements, aligning with Rahman's (2023) research findings that the use of Islamic geometric patterns in contemporary product design enhances acceptance among Muslim consumers.

Figure 3: Mood board of decorative lantern products for Eid festivals

Product Range

Three distinct decorative lighting styles were developed:

- Pendant decorative lantern
- String light decorative lantern
- Mobile hanging lantern

Each design incorporates traditional Islamic geometric patterns, contemporary lighting technology, sustainable material use and cultural symbolism.

Figure 4: Design sketches of decorative lanterns crafted from batik fabric scraps for Eid festivals

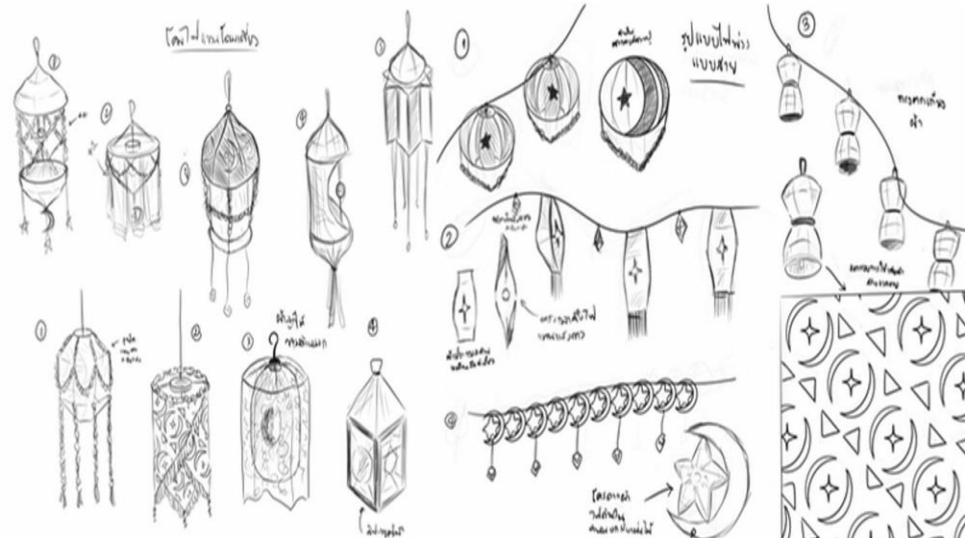

Figure 5: Design sketches of decorative lanterns crafted from batik fabric scraps for Eid festivals

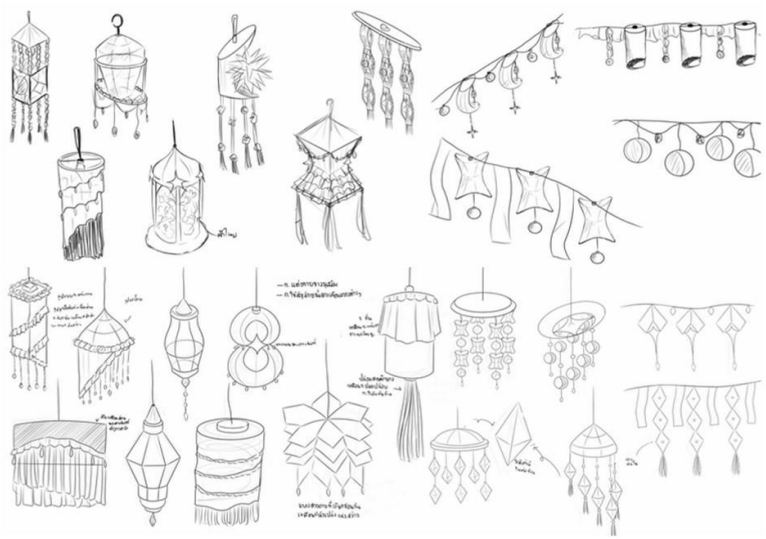

Figure 6: Final designs of decorative lanterns crafted from batik fabric scraps for Eid festivals

Product Evaluation Results

The prototypes of decorative lanterns crafted from batik fabric scraps for Eid festivals were evaluated by five product design experts based on criteria encompassing aesthetic patterns and colors, uniqueness, contemporary appeal, and suitability for home decoration. The evaluation employed a five-point Likert scale for assessment, with the comprehensive results of the decorative lamps from batik fabric scraps for Eid festivals presented in Table 1.

Table 1: The evaluation results of decorative lanterns prototypes made from batik fabric waste

Type of decorative lanterns from fabric scraps	List	Mean	S.D.	Level of satisfaction
Pendant decorative lantern 	Beautiful patterns and colors	4.20	0.75	Good
	Be unique	4.20	0.75	Good
	Be contemporary	4.40	0.49	Good
	Suitable for home decoration	4.60	0.49	Excellent
	Total	4.35	0.62	Good
String light decorative lantern 	Beautiful patterns and colors	3.60	0.49	Good
	Be unique	3.40	0.49	Average
	Be contemporary	3.80	0.75	Good
	Suitable for home decoration	4.40	0.49	Good
	Total	3.80	0.55	Good

Table 1: The evaluation results of decorative lanterns prototypes made from batik fabric waste(Continue)

Type of decorative lanterns from fabric scraps	List	Mean	S.D.	Level of satisfaction
Mobile hanging lantern 	Beautiful patterns and colors	4.60	0.49	Excellent
	Be unique	4.60	0.49	Excellent
	Be contemporary	4.60	0.49	Excellent
	Suitable for home decoration	4.40	0.49	Good
	Total	4.55	0.49	Excellent

The evaluation results of decorative lantern prototypes made from batik fabric scraps for Eid festivals, as assessed by five product design experts, revealed that the mobile hanging lantern received the highest evaluation score, followed by the pendant decorative lantern and the string light decorative lantern, respectively. In analyzing specific aspects of the mobile hanging lantern, the evaluation showed that beautiful patterns and colors, uniqueness, and contemporary appeal received equally high scores (mean = 4.6), followed by suitability for home decoration (mean = 4.4). Regarding the pendant decorative lantern, suitability for home decoration achieved the highest score (mean = 4.6), followed by contemporary appeal (mean = 4.4), while beautiful patterns and colors and uniqueness received equal scores (mean = 4.2). For the string light decorative lantern, suitability for home decoration garnered the highest score (mean = 4.4), followed by contemporary appeal (mean = 3.8) and beautiful patterns and colors (mean = 3.6), respectively.

The experimentation with diverse design approaches has led to the development of prototypes that successfully fulfill both aesthetic appeal and functional requirements. The research findings demonstrate the feasibility of developing valuable products from waste materials while maintaining craftsmanship and cultural significance.

Figure 7: The prototypes of decorative lanterns crafted from batik fabric scraps for Eid festivals

3. Conclusion

The findings of this research demonstrate the feasibility of upcycling batik textile waste into valuable decorative lighting products. These products achieve a harmonious balance between functional performance, aesthetic excellence, and sustainable design principles, while effectively respecting cultural context. The success of this development indicates the potential for creating culturally meaningful products through sustainable design practices.

The development of lighting products from textile waste successfully created innovations that serve both functional and aesthetic purposes, aligning with Martinez's (2024) theory that sustainable design must balance utility, aesthetics, and environmental impact. The research findings can be summarized according to the following objectives:

Material Research and Development

The study identified unique properties of different textile waste types suitable for lighting design, particularly varying light diffusion capabilities. Rahman (2023) emphasizes these characteristics as crucial factors in lighting product design.

Production Technique Development

The innovative patchwork techniques developed created distinctive patterns and textures, supporting Kim's (2024) emphasis on production techniques that add value to waste materials.

Product Design and Development

The research developed three distinct types of decorative lighting products. The pendant decorative lantern features a suspended design that incorporates traditional Islamic patterns and provides ambient lighting. The string light decorative lantern allows for flexible arrangement, creating connected lighting effects that are particularly suitable for festival decoration. The

mobile hanging lantern features dynamic movement, creating interactive light patterns while combining aesthetic appeal with playful elements. Each design integrates Islamic geometric patterns with contemporary lighting technology, maintaining cultural authenticity while meeting modern functional requirements. The development prioritizes both traditional artistic elements and sustainable design principles, resulting in products that are culturally meaningful and environmentally conscious, which Abdullah (2024) identifies as critical factors in designing products for Muslim communities.

4. Recommendation

Future research directions should explore several key areas: advancing production technology to improve manufacturing efficiency, integrating digital technologies into pattern design processes, conducting comprehensive market research to expand the eco-friendly consumer base, and developing new products that utilize textile waste materials. These research directions would contribute to both the technological advancement of sustainable product development and the expansion of market opportunities for upcycled textile products.

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