

## Research on Fabric Surface Effect Techniques to Design Men's Garments for Sustainable Development

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### Abstract

*Along with the development of industrialization and modernization, the rapid development of fast fashion has made the source of raw materials exhausted by the continuous purchasing and production in order to promptly meet the needs of customers. garment. In addition, the emissions from the garment industry as well as the huge amount of discarded clothes that cannot be decomposed in time cause serious pollution. In the context that the world environment is at an alarming rate, the production of fashion products following sustainable fashion trends is a method of special interest. Sustainable fashion is being researched and applied more and more in the field of fashion design. In this article, the research team explores the sustainable fashion development orientation of companies and groups in the world and analyzes the development situation of sustainable fashion trends in Vietnam. The main method of research is using Boro and Sashiko techniques. This is one of the techniques that does not waste materials and creates interesting surface effects from the stitching technique. The research results are a combination of synthetic materials and recycled denim and stitching techniques to design a sustainable fashion collection. The study contributes to the development of a sustainable fashion product line serving the needs of society shortly, creating a new process that minimizes waste and harmful substances to the environment in the future.*

Keywords: Boro technique, Sashiko technique, sustainable fashion.

### 1. Introduction

The global fashion industry, driven by the 'fast fashion' business model has contributed to an increased volume of products with shorter life cycles, accompanied by deflation of retail prices [1]. This creates a supply chain that produces clothes at increasingly low prices. Low price comes with low product quality, consumers consider this as a disposable product, which leads to the purchase of new clothes and the disposal of used products. This overconsumption of apparel leaves an environmental nightmare in its wake [2]. This collection considers reuse rags in the garment factory's production process to minimize waste in line with sustainable fashion trends.

Sustainable fashion is a part of the slow fashion movement and is often described as the opposite of fast fashion. This trend is mainly associated with environmental sustainability, such as the use of renewable and eco-friendly raw materials, the reduction of the carbon footprint, durability, and longevity [3]. There are various manufacturing techniques based on sustainable design principles, e.g renewing materials, using organic raw materials, using traditional production techniques, recycling, and reusing used materials [4].

The Boro technique (patch sewing technique) and the Sashiko technique (hand stitch technique) are garment techniques associated with Japanese history. The term 'Sashiko' refers to a quilting stitch used to sew together layers of material, it is a form of needlework that is both functional and decorative [5]. This technique originated in the rural areas of Aomori and Yamagata in northeastern Japan in the early Edo period (1615-1868) [6]. The Boro technique appeared soon after, in the late Edo period [7]. This is a Japanese patchwork technique. Boro is a Japanese word for "tattered rags", and specifically indicates clothes are patched with pieces of fabric, to cover the torn. These techniques are used to repurpose fabrics that were saved within a family over time and eventually sewn into a patchwork garment and considered an eco-art against consumer-oriented culture nowadays [8]. This is the reason why Boro and Sashiko techniques still survive in the modern recycling range, enhancing the value of recycled apparel and sustainable design. The Sashiko stitch was the main addition to each Boro piece, a variety of small running stitches that brought a purposeful yet decorative value to each garment [9].

Streetwear fashion is what everyday people on the street are wearing [10]. With the original starting point of the hip-hop culture, skateboarding culture in the 70s, over more than 50 years of development, street fashion has been shaped and expressed into a number

of typical fashion styles such as: Hiphop, Skater, Punk-goth... [11]. Through the process of development, streetwear has been integrated into the general fashion trend of the world and has a profound influence on the fashionistas, especially young people - people with a free spirit, comfortable, more willing to take to the streets, enjoy a more exciting, passionate lifestyle. Boro and Sashiko techniques are unique techniques, creating eye-catching and highly personalized effects because each product created is unique. Therefore, it is appropriate to combine these two techniques into street fashion and create many novel products.

Nowadays, Boro technique and Sashiko technique are widely applied in the design industry such as interior design, accessory design, and especially in fashion. However, these two techniques have not been widely applied in Vietnam. Therefore, the authors want to study more deeply the Boro and Sashiko techniques and exploit their aesthetic value in streetwear design.

## 2. Experiment

### 2.1. Research Subjects

This study is an overview of Boro and Sashiko techniques, experimenting with different fabric combinations, synthesizing and analyzing the aesthetic and functional advantages and disadvantages of the options, thereby applying them to fashion product design, exploiting the characteristic image of Boro technique combined with Sashiko technique to design men's apparel for Moi Dien.

### 2.2. Research Methods

The research method used by the authors in this study is an interdisciplinary approach includes:

- Historical research method about Boro and Sashiko techniques.
- Synchronous research method: Research, analysis and evaluation of contemporary Boro and Sashiko techniques applied to fashion in the world and Vietnam.
- Experimental method: Analysing and evaluating Boro and Sashiko technical prototypes with different materials and colors. Completing fashion collection inspired by Boro and Sashiko techniques.

## 3. Results and Discussion

### 3.1. Influence of Boro Technique and Sashiko Technique in Fashion Design

The influence of Boro and Sashiko techniques on fashion design is reflected in the typical use of indigo blue in the designs, a combination of multiple pieces of free-form fabric and stitching. These two techniques can be applied on many different materials such as denim, khaki, and rough fabric... with different surface effects such as texture, stripe, and monochrome.

Boro's tattered element and Sashiko's decorativeness have inspired many modern fashion designers around the world. By taking advantage of small pieces of fabric in the production process and using the Boro patchwork technique and Sashiko stitch technique to design a product with high aesthetics and minimizing waste to the environment, designers want to convey the message of saving resources, reducing the use of new materials and protecting the environment.

Research based on: Exploitation designs using Boro and Sashiko techniques in the world and Vietnam, the authors have drawn some key design methods inspired by these two techniques as follows:

- Method 1: Use Boro and Sashiko techniques to create a surface effect for the outfit (Fig. 1).
- Method 2: Apply Boro and Sashiko techniques to create accents in the form of decorative arrays for apparel (Fig. 2).
- Method 3: Use the effects of Boro and Sashiko techniques to create a pattern for the outfit (Fig. 3).



Fig. 1. Valentino Spring 2016 Menswear Collection.



Fig. 2. Fashion collection collaboration between brands S'YTE and KUON in 2021.



Fig. 3. Altuzarra Spring 2014 Ready-to-Wear Collection

### 3.2. Experiments with Boro and Sashiko Techniques on Materials

#### 3.2.1. Experimental selection materials

The materials used are scraps of rags and excess fabric in the production process collected by the authors from garment factories in Hanoi city.

The team selected experimental materials (Fig 4) with a different surface, color, and texture characteristics to select the type of material, and the treatment is suitable for Boro and Sashiko techniques and suitable for the design of the men's streetwear collection.



Fig. 4. Experimental materials

The fabrics used to create the Boro and Sashiko effect are thin, non-stretch woven fabrics, sewn on a thick woven fabric background, so they do not change the physical and mechanical properties of the main fabric. This ensures the required form and structure of the outfit.

#### 3.2.2. Review of test samples

The test samples include 6 samples (Fig 5):

- Sample 1: Grafting textured fabric and folding fabric edges.
- Sample 2: Grafting textured fabric and unfolding fabric edges.
- Sample 3: Grafting textured fabric with solid color fabric and folding fabric edges.
- Sample 4: Grafting textured fabric with solid color fabric and unfolding fabric edges.
- Sample 5: Grafting solid color fabric and folding fabric edges.
- Sample 6: Grafting solid color fabric and unfolding fabric edges.

Through experiments based on the aesthetics of materials and treatment methods when applying Boro and Sashiko techniques, the authors offer some suitable options for application in fashion as follows:

- Materials: Combination of different materials to create surface effects.

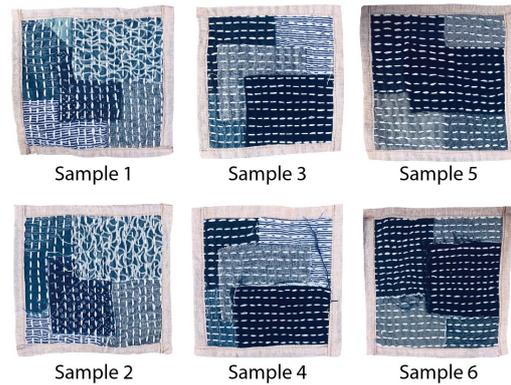


Fig. 5. Test samples.

- Color: Coordination shades of indigo blue such as white, sky blue, blue, charcoal...

- Structural edge of the fabric: unfold or fold the edge of the fabric.

#### 3.2.3. Applying samples in the fashion collection design

After reviewing the test samples, the team concluded and selected a design plan to use for the collection: using Boro and Sashiko techniques, and mixing textured fabrics, solid color fabric, and unfolding fabric edges like sample 4.

Table 1. Comparison of the characteristics of fabric grafting types and edge treatments in Boro and Sashiko techniques

Characteristics	Option	Aesthetic features
Grafting type	Grafting textured fabric	Composition mess, Sashiko stitches can't stand out
	Grafting textured fabric with solid color fabric	Harmonious layout, balancing two elements Boro and Sashiko
	Solid color fabric	Monotonous color
Edge treatments	Unfold the edge of the fabric	Has a natural ripped edge of fabric effects
	Fold the edge of the fabric	Clean

Reason for selection is shown as follows:

- Aesthetics effect: The option of using textured fabric combined with solid color and unfolding edges of the fabric creates a harmonious product surface in terms of layout, with a tassel effect from the fabric. These two elements highlight the Boro patchwork technique and the Sashiko stitch technique.

- Implementation process: The untreated border edge of the fabric helps the designer easily to reduce stage of folding. This leads to faster design pattern implementation. Besides, the folding of the fabric edge forms many thick layers of fabric, making it difficult for hand stitchers to manipulate and take more effort in the process.

### **3.3 Pre-Design Research for the Fashion Collection Inspired by Boro and Sashiko Techniques**

#### **3.3.1. Design purpose**

From the above research results, the authors researched the fashion brand Moi Dien and proposed a men's fashion collection aged 25-30 using the Boro technique and the Sashiko technique.

#### **3.3.2. Overview of the brand Moi Dien**

Moi Dien is a domestic fashion brand for young people, founded in 2016 by designer Tom Trandt [12]. The brand pursues sustainable trends and is constantly looking for solutions from recycled materials, natural materials, and environmentally friendly materials. Moi Dien's products have a youthful, liberal, freestyle, and focus on exploiting the surface of materials and unique designs [13].

From the research on demographics and customer behavior psychology of Moi Dien, the authors identified the brand's customers are young people between the ages of 25 and 30 who have a sense of their individuality and want to express it through fashion (Fig 6). They are people who enjoy special things and are interested in locally made products. The brand's target customers are people who have a lot of experience, are looking for something new, are shaping their fashion sense, and are confident enough to try new things [14].



Fig. 6. The target customers of Moi Dien.

#### **3.3.3. Trend research 2023 for men**

After researching fashion trends in the world and in Vietnam [15], analyzing an overview of Sashiko techniques, and an overview of the Moi Dien brand, the authors have made a summary of the collection's fashion trends as follows:

- Silhouette: trapezoidal and rectangular.
- Line: straight line.
- Color: combination of shades of Indigo blue.
- Layout: asymmetrical.
- Highlight feature: Boro and Sashiko techniques.

### **3.4. Fashion Collection Design Concept Inspired by Boro and Sashiko Techniques**

#### **3.4.1. Style of collection**

The collection uses the style that Moi Dien is pursuing youthful, liberal, and free; basic outfit rendering that accentuates the Boro and Sashiko effects.

#### **3.4.2. Story and message**

*Story:* Boro and Sashiko are traditional Japanese techniques. The poor peasants of Japan during the war used these two methods to strengthen and mend old, worn-out places on clothes, these clothes are passed down from student to children, over a long time it is made up of tens of hundreds of pieces of cloth - is history, is the story, is the spirit of saving, respecting resources of the Japanese people. Not only is it a technique of embroidery, but it is also a precious Japanese concept of life: Don't waste and use old things with gratitude. Today, Boro and Sashiko are applied in design in a more modern and new way, but still retain the culture to convey the message of the nation's history, reminding young people to practice the spirit of thrift and protect the environment.

During the garment manufacturing process, excess pieces of fabric are thrown away and are no longer used. By utilizing these fabrics in combination with Boro and Sashiko techniques, designers give fabrics a new, useful and beautiful life. These little pieces seem to be reborn with a better future of being used by consumers instead of ending up in landfills.

*Message:* Live economically and be environmentally friendly.

#### **3.4.3. Material selection**

Selected materials for the collection are denim, khaki, 100% cotton knit single jersey, satin, linen, are suitable for summer.

The material applied for creating the Boro effect surface is small pieces of fabric from denim, khaki, and rough fabric.

Fashion moodboard for collection "New life" is shown in Fig. 7.

**3.4.4. Design sketches**

The research team makes sketches of products based on Table 2. Fig. 8 shows the Sketches of the “New Life” collection

After considering fashion trends, fine arts, processing, product comfort, and sales ability as well as brand and user suitability, the authors made a table of evaluation criteria for choosing products as follows :

**3.4.5. Product evaluation and development**



Fig. 7. Moodboard



Fig. 8. Sketches of the “New Life” collection with product codes

Table 2. Products line plan for the spring-summer 2023 collection of the brand Moi Dien

Type of product	Form	Materials	Prices	Product line	Number of products/code
T-shirt	Regular fit	100% Cotton knit single jersey	15\$ - 28\$	2 basic product codes	2 codes, 100 products/code
Shirt	Slim fit, oversized	Oxford, satin, denim, linen	28\$ - 70,5\$	1 basic product code, 2 fashion product codes	3 codes, 100 products/code
Jacket	Kimono, gilets, overshirt	Denim, khaki	45\$ - 105\$	1 basic product code, 2 fashion product codes	3 codes, 100 products/code
Trousers	Jeans, Cargo Pants	Denim, khaki	29\$ - 62\$	1 basic product code, 3 fashion product codes	4 codes, 100 products/code
Bags	Tote bag, handbag	Denim, khaki	21\$ - 70,5\$	1 fashion product code	1 code, 100 products/code
Hat	Cap, bucket hat	Denim, khaki	28\$ - 51\$	1 fashion product code	1 code, 100 products/code
Jewelry	Ring, necklace, bracelet	Stainless steel	13\$ - 30\$	1 fashion product code	1 code, 100 products/code

Total products: 15 product codes

Table 3. Evaluation criteria for choosing products

Fashion trend	1. Color matches the spring/summer 2023 trends and the collection.
	2. Form matches the spring/summer 2023 trends and the brand’s characteristics.
	3. Material matches the form.
	4. Material matches the price.
Aesthetics	5. Tight product layout.
	6. Match the collection theme.
Processing	7. Possibility of color fading.
	8. Suitable for industrial production.
	9. Processing time is suitable for product cost.
Product comfort	10. The convenience of using the product.
Sales ability	11. The price is suitable for customers.
	12. The ability to coordinate and synchronize.
Brand and user suitability	13. Consistent with the brand’s creative philosophy.
	14. Products suitable for customers.
Total score: 14	

- Design evaluation:

Table 4. Products evaluation

Criteria	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Points deducted	Result
T1					x			x							2	Reject**
T2								x							1	Develop colors
T3															0	Develop colors
S1															0	Develop colors
S2					x										1	Redesign*
S3		x												x	2	Reject**
S4															0	Develop colors
K1								x							1	Develop colors
K2					x			x							2	Redesign*
K3								x							1	Develop colors
Q1								x							1	Develop colors
Q2					x										1	Redesign*
Q3								x							1	Develop colors
Q4								x							1	Develop colors
Q5								x			x				2	Reject**
P1								x							1	Accept***
P2								x							1	Accept***
P3								x							1	Accept***
P4								x					x		2	Reject**

(Note on table 4:

\*: redesigned products are due to insufficient production code according to the product line plan table.

\*\* : the rejected products are due to having enough production code according to the product line plan table.

\*\*\*: the accepted products are due to the small number of products, the development of more colors leads to a small number of products/colors.)

- Color development for items are shown in Fig. 9, Fig. 10, Fig.11, Fig. 12.

- Color combination for collection is shown in Fig. 13, Fig. 14, Fig. 15.

- The ability to coordinate and synchronize the designs is shown in Fig. 16.

- Range plan of the final collection is shown in Fig. 17.

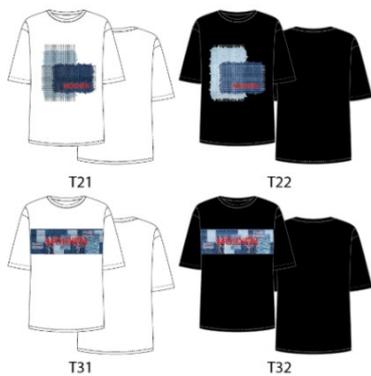


Fig. 9. T-shirts color development



Fig. 10. Shirts color development.



Fig. 11. Jackets color development



Fig. 12. Trousers color development



Fig. 13. Shirt design redevelopment and color development for the S2.



Fig. 14. Trousers design redevelopment and color development for the Q2.



Fig. 15. Jacket design redevelopment and color development for the K2



Fig. 16. Collection sketches

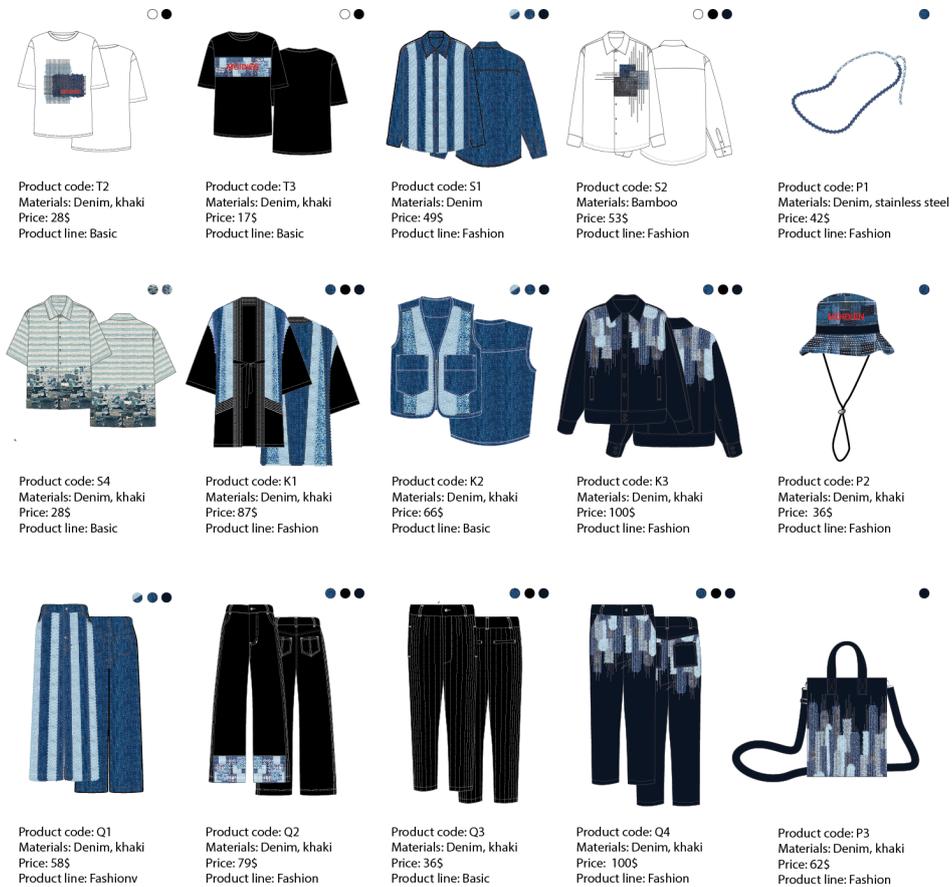


Fig. 17. Product development

### 3.4.6. Product samples

After evaluation and development designs, the authors choose 3 sets of designs to develop in next step (Fig. 18). The final products are shown in Fig. 19.



Fig. 18. Selected design sketches



Fig. 19. Finished products

The result of this article is exploiting the artistic image of Boro and Sashiko techniques into streetwear design. The idea of designs is developed based on analyzing previous designs that have been applied Boro and Sashiko techniques and current fashion trend of the two this techniques as well as world fashion trends. Inheriting modern creative thinking, the products in the collection are developed from basic shapes and decorated using Boro and Sashiko techniques.

The innovation introduced into this design is the surface treatment when combining different materials in product decoration using Boro and Sashiko techniques. By applying the above elements, the designs in the collection ensure high applicability for all products both in terms of design and technical aspects.

### 3.4.7. Sustainable fashion trend of the collection

The design and development process of a collection using fabric scraps from the manufacturing process as the primary material involves steps such as: conceptualizing the design, material selection and development, pattern effect design, completing the product.

To begin this process, the authors set out to learn the history of the Boro technique and the traditional Sashiko technique. After sketching, the research team selects and adjusts materials obtained from garment factories. Each small piece of fabric is carefully adjusted to each pattern to achieve the best design. Traditional Sashiko stitches are hand-stitched on several patches across the designs. The fine craftsmanship of the Boro and Sashiko designs adds to the quality of the product.

The use of rags and excess fabric in the production of garment products helps to reduce waste to the environment. Combined with Boro and Sashiko techniques, designers can create unique new products using these materials to enhance product value and protect the environment.

## 4. Conclusion

Boro patchwork technique and traditional Japanese Sashiko hand-stitching create many unique and highly aesthetic surface effects that have provided creative inspiration for many fashion designers. Thoroughly applied and exploited, these two techniques contribute to minimizing waste and harmful substances in the production process, limiting the use of new materials, and improving consumer awareness since then, contributing to the development of sustainable fashion.

From the sources of Boro and Sashiko techniques and the applications of these two techniques in fashion design, these research results provide a specific view of Boro and Sashiko, and application in modern fashion design. In this article, the research team developed a men's streetwear collection for Moi Dien following sustainable fashion trends for this brand.

The study shows the influence and application of Boro and Sashiko techniques in fashion design as well as the benefits of these two techniques with sustainable fashion trends.

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