Creation of fiber art from fabric waste using weaving, collage, and patchwork techniques

Adam Wahida [a,1,*], Endri Sintiana Murni [a,2]

[a] Art Education Study Program, Universitas Sebelas Maret, Surakarta, Jl. Ir. Sutami No. 36 A, Surakarta, Indonesia
[1] adamwahida@staff.uns.ac.id *; [2] endrisintianamurni@staff.uns.ac.id
* corresponding author

ARTICLE INFO

Article history
Received 2024-11-11
Revised 2025-03-03
Accepted 2025-03-24

Keywords
Fiber art
Fabric waste
Textile waste
Sustainability

ABSTRACT

In addition to contributing to economic growth, the textile industry has the potential to produce large amounts of fabric waste, which often ends up in trash cans and pollutes the environment. Responding to these conditions, this study aims to explore the use of fabric waste as the main material in the creation of fiber art, evaluate environmental and economic benefits, and see positive impacts on society. This research uses an art practice-based approach to create fiber art from waste materials using weaving, collage, and patchwork techniques. The method includes collecting and selecting fabric waste based on the type of textile material, applying various artistic techniques, and analyzing the aesthetics and functionality of the artwork made. The results of the study show that textile waste created through a combination of weaving, collage, and patchwork techniques can produce artistic and aesthetic fiber artworks. This fiber artwork contributes to the concept of sustainability in fine art and emphasizes that fabric waste can be converted into creative products to extend the life cycle of materials. Thus, it can open new opportunities in the recycling-based creative industry.

1. Introduction

Surakarta is one of the largest textile industry cities in Indonesia. The existence of the textile industry on various scales has contributed to the economic growth of the people of Surakarta. According to a report by the Central Statistics Agency of Surakarta City in 2020**,** the textile and apparel sector contributed around 17.53% to the Gross Regional Domestic Product (GDP) of Surakarta City based on prevailing prices. This figure shows that the textile and apparel industry is the dominant sector in the city's economy, contributing greatly to economic growth and job creation in Surakarta. The creative economy ecosystem in the textile industry is formed from the interconnectedness of various elements that support the sustainability and development of this sector, especially at the Micro, Small, and Medium Enterprises (MSMEs) level. This ecosystem includes various interconnected aspects, from business actors, labor, technology, markets, and government regulatory support. With the development of the creative economy ecosystem in the textile industry, MSMEs can grow stronger and more competitive. This shows that the textile industry is not only economically important but also culturally and socially significant. Although it contributes significantly to the local economy, the increase in textile and apparel production in Surakarta also has the potential to increase the amount of fabric waste, which is a challenge for environmental sustainability. Textile waste, especially fabric residues from unused production processes and final products, is often not managed properly, causing buildup in landfills and contaminating soil and water [1]. Liquid waste and toxic gas emissions have contaminated water and air, as well as fabric waste from production, into piles of garbage that pollute the soil and are difficult to decompose [2]. For this reason, all parties need to be aware of and concerned about overcoming these negative impacts.

In contemporary fine art, awareness of the environmental crisis can expand the exploration of various ideas, forms, media, presentations, and functional values of art [3]. Contemporary art is open to treating the environment and natural resources well and can encourage social change [4]. This openness is shown through material exploration, such as using waste as a material to create works of art. Material exploration is very important to show the essence of the artist's idea, bringing new experiences and awareness to society. Several studies show that the use of textile waste for the manufacture of artworks has been implemented in various countries as a creative and sustainable solution. For example, in Europe and America, artists and designers began to utilize scrap fabrics and other textile materials to create high-value artworks and products. This practice helps reduce textile waste and increases public awareness of the importance of recycling and reusing materials [5]. Fiber art that uses textile waste is closely related to contemporary fine art, especially in terms of material exploration, sustainability concepts, and experimental approaches**.** Contemporary art often pushes the boundaries of traditional media, thus encouraging the use of alternative materials**,** including textile waste. Fiber art uses various techniques such as weaving, patchwork, and collage, which are adapted in contemporary art to create works based on recycled materials. As such, fiber art from fabric waste is part of a sustainable art movement, where artists seek to transform waste into works of art that have ecological significance**.**

One of the efforts to overcome the textile waste problem in Surakarta is making fiber artwork. Textile waste in the form of fabric residues can be processed into more valuable products. The visual aesthetic potential of motifs and fibers in fabric waste can be explored to discover new aesthetic-artistic value in fiber artworks. The characteristics of fiber artwork are based on fiber as a carrier of visual expression, mainly including fiber materials, technology, design, and other factors used and redesigned [6]. The texture and visual expression of fiber are beautiful with new and unique effects, which are the main content of fiber art and the distinctive features that distinguish it from other forms of fine art [7]. Fiber art is widely used in the design of space decoration, which is combined with unique material attributes, technology, and creative elements so that the artistic effect of space decoration reaches a higher level [8]. Fabric waste is a type of inorganic waste that does not decompose quickly. A few industries still process fabric waste compared to paper or plastic waste.

According to data from the Indonesian Ministry of Industry and the Central Statistics Agency, plastic recycling is around 600 industries, especially for plastic bottles, packaging, and building materials, paper recycling is around 400 industries, especially for cardboard and wastepaper, textile recycling is less than 150 industries, most of which are small-scale and MSME-based. However, with proper processing, fabric waste has the potential to make products with high selling value [9]. The processing and utilization of fabric waste in handicrafts can increase creativity and have aesthetic value [10]. Fabric waste can be developed into innovative products that have economic, aesthetic, and functional value by further processing through various material design experiments, such as the use of techniques in sewing [11]. In addition, the upcycling method can increase the functional value, emphasizing the increased value of material benefits [12]. In interior design, fabric waste can be used to make home décor products, such as lampshades, chandeliers, pillows, and wall hangings. Techniques for combining one fabric with another are patchwork, embroidery, quilting, and appliqué. The combination of these techniques can produce a variety of motifs [13]. Some of these references show that fabric waste has the potential to be processed and developed into more valuable creative products.

The development of contemporary art has integrated the boundaries of disciplines in fine art. All visual materials, whether raw materials (such as paint, canvas, charcoal, pastel, resin, clay, wood, metal, stone, *etc*.) or ready-made materials (finished objects found or collected, including textile waste) can be materials for the creation of fine arts, and all branches of fine arts such as paintings, sculptures, crafts, designs can relate to each other to expand artistic and aesthetic achievements. Under these conditions, artists can explore artistic aesthetics through various media of expression, including textile media that give rise to fiber artworks [14]. Fiber art is an acceptable artistic expression medium combining multiple fibrous or fibrous materials. There are forms of weaving, sewing, embroidery, knitting, or decorating with beads that serve as wall decorations. There are also other techniques, such as braiding, coiling, tying, crossing, winding, or wrapping. Fiber artwork can be made with fabric, yarn, rope, leather, or other media, such as bark, leaves, plant stems, and grass [15]. The material gives a distinct characteristic identity in fiber artwork due to its unique and expressive meaning.

Meanwhile, from the visual effect, the diversity of material properties also brings differences in expression. First, different materials will produce diverse texture effects, such as contrast, warm-cold, wet-dry, hard-soft, or light transmission. Secondly, the visual illusion will also get different perceptions according to the size of the volume, thickness, etc. Its density, order, and rhythm will release an artistic conception consistent with the environment in the audience's vision, touch, and psychology [6]. Overall, visual form plays an important element in artistic practice in addition to process or technique. Most fiber art production involves manipulating materials to create tangible and tactile qualities in the work through the materials' characteristics. Thus, fiber media and creativity in various formats of embodiment have unlimited aesthetic-artistic potential. This shows that fiber art is a diverse subject that needs to be studied and developed through art and scientific research. However, fiber art from fabric waste also has technical challenges related to the durability of materials and production techniques. Limited market challenges and a lack of the textile recycling industry. Social and cultural challenges include a lack of documentation and archives as well as the heritage of traditional techniques that are beginning to disappear. In addition, it also has material limitations, such as size and structure, susceptibility to environmental factors, and limitations in color and pattern. To overcome these problems, an innovative and sustainable approach is needed. One solution that can be applied is to make fiber artwork using fabric waste materials. Fiber art, which involves the use of natural or artificial fibers in various creative techniques such as weaving, knitting, and sewing, offers an excellent opportunity to recycle fabric waste into art of aesthetic and economic value. This study aims to examine how fabric waste can be used in the manufacture of fiber art, evaluate the environmental and economic benefits of this approach, and see the positive impact that can be caused to the people of Surakarta.

2. Method

The creation of fiber artworks from fabric waste materials uses research methods based on art practices. Research through art practice centred on 'studio' projects can lead to the production and presentation of creative works. In the approach of research through art practice, the specificity of creative practice sets parameters and determines the methods necessary for related research. The emphasis is partly on the material of the art production process and the expansion of the contemporary cultural context in which the artist operates. Margolin describes the approach to research through art and design, centred on 'studio projects' as a practical approach to research that is not limited by traditional methodologies but seeks to 'facilitate the relationship of reflection with practice' [16]. Analysis in studio project-based art and design research involves several aspects. Materials analysis focuses on the exploration and testing of materials in art/design projects using experimental methods of texture, color, and durability of materials. Technical analysis focuses on the technical feasibility of creating work using process documentation methods, method comparison, and technical revision. Conceptual analysis focuses on developing the ideas behind artworks/designs using art theory study, personal reflection, criticism, and discussion. Visual analysis focuses on the evaluation of visual elements such as composition, color, and shape using composition studies, layout experiments, and symbolic meanings. Contextual analysis focuses on the relationship of a project to artistic, cultural, or social trends using literary study methods, interviews, and case studies of the work of other artists.

Art practice-based research methods specifically address how creative works develop and expand knowledge of specific areas of artistic practice. Through experimentation and reflection**,** the creation of fiber art can expand the understanding of artistic practices, technical innovations, and the role of art in environmental issues**.** The research results are not only in the form of written theories, but also visual works with aesthetic and intellectual value. Research-based fiber art can make a significant contribution to contemporary art**,** especially in the context of sustainability and material innovation. The art practice-based research method proves that field practice is refreshing by asking new questions about the formation of discourse involving materials, forms, and sources of inspiration for sustainable creative activities. It can also capture something of the 'thought structure' at work in the creative arts practice, thus revealing the artist as an intellectual. In practice-based research, creative artifacts are the basis for contribution to knowledge. This method is applied to original investigations that seek new knowledge through practice and results. Creative artifacts are accompanied by a critical discussion of the significance and context of the claims, and a full understanding can only be achieved through the cohesive presentation of creative artifacts and critical interpretation [18].

The ecological and sustainability theoretical framework is used to interpret fiber artwork as part of the sustainability movement and criticism of textile waste. Researching the use of recycled materials in fiber art as an ecological solution and interpreting natural fibers as a medium that represents the relationship between humans and nature. Research through art practice involves creating and producing works of art, making cultural presentations, exploring, and transforming the knowledge that occurs in the process as action research. Where knowledge is acquired as an inactive act and is directly related to the creative process, the knowledge that 'emerges' may be abstract, theoretical, or practical, gained from the application of a developing creative methodology. The consequence of this methodology is the artwork itself, but it can also emerge further into the public eye through the development of practice-based research methodologies [19]. Reflective evaluation techniques to assess the creative process through self-reflection using a diary of experiments, artistic decisions, challenges, and changes in the creative process. Visual and aesthetic evaluation to assess design elements, composition, and visual appeal. Conceptual and narrative evaluation to assess how ideas and messages in the artwork can be understood by the audience.

The stages of research on making this fiber artwork are (1) collecting and classifying fabric waste based on type, color, and size, (2) identifying the potential use of fabric waste materials in fiber art, (3) identifying fiber artworks including textile fiber processing, using weaving techniques, collage techniques, and creating applied artworks, (4) analyzing fiber artworks through an aesthetic approach, artistic, and ergonomic. The creation of fiber artwork involves a series of creative and technical steps that make it possible to express ideas using fibers and textiles as the main medium. This method includes the selection of materials, craftsmanship, and finishing processes designed to produce aesthetically pleasing and meaningful works of art. The first step in the creation of a fiber artwork is the selection of materials. The materials used can be natural fibers (such as cotton, wool, silk, and linen) or synthetic fibers (such as polyester and nylon). Additionally, fiber art often uses recycled fabrics or textile waste to create more environmentally friendly works. The selection of materials is based on physical properties (such as strength, softness, durability), texture, color, and the ability of the material to be processed with the desired technique. For example, cotton fabric can be chosen for quilting because of its easy-to-sew nature, while wool can be chosen for felting because of its easy-to-tie fibers. The material is cut, washed, dyed, or given special treatment to achieve the desired condition. This process may include cutting the fabric into specific shapes or sizes, dyeing with resist-dyeing techniques such as shibori or batik, or adding textural elements such as embroidery or appliqué.

Once the materials have been selected and prepared, the next step is to design and plan the artwork. This stage involves the development of visual concepts and compositions. Concept development considers the theme, message, or story you want to convey through your work. These ideas can come from personal experiences, social issues, nature, or cultural inspiration. This concept will affect the selection of colors, materials, and techniques. Next, create a sketch or visual map to determine how design elements (such as shapes, colors, and textures) will be organized in the work. These compositions can be made on paper or directly on the fabric to plan the layout and structure of the work. Various techniques are used in the creation of this fiber art, depending on the style and effect desired. Some of the main techniques used, namely patchwork, incorporate multiple layers of fabric with sewing techniques to create a specific pattern or design. Weaving fibers or yarns using looms to make intricate fabrics or fiber artworks. Collage is the technique of attaching several types of fabrics to form a specific visual object.

3. Results and Discussion

Creating fiber artwork using fabric waste materials involves several stages, from material selection to finishing. This process requires creative thinking, experimentation with different techniques, and technical skills.

3.1. Collection and Classification of Fabric Waste

This research began with the collection of fabric waste from various sources in Surakarta, including convection, textile factories, and households. The waste is then classified based on the type of material, color, and size to determine its potential use in fiber artwork. The total fabric waste is three standard-sized sacks (60x100 cm) consisting of 25 kg of light fabric (cotton, nylon, polyester, silk), 15 kg of medium fabric (denim, linen), and 15 kg of heavy fabric (wool). Fabric waste is classified based on the type of material, color, and size to determine its potential use in fiber artwork. Colors are grouped

into primary colors (red, yellow, blue), secondary colors (orange, purple, green), and tertiary colors (brown, ochre, red-ochre, brown-ochre, yellow-ochre, dark brown), as well as black and white. Meanwhile, the size is categorized into small pieces (< 10 cm), medium (10-50 cm), and wide (>50 cm).

1) Classification by Fabric Type

To classify the types of fabric waste based on material, color, and size in determining their potential use in fiber artwork, a systematic approach is needed to consider each piece of fabric's physical and aesthetic characteristics. Fabric materials determine the physical properties and handling in the manufacture of fiber art. The type of material also affects the durability, texture, and processing methods needed, see Table 1.

Table 1. Classification of textile waste by material

Material Type	Description
Cotton	Easy to sew and colour, it is ideal for works that require softness and flexibility. Cotton can be used for quilting or other sewing techniques.
Linen	Natural solid fibre has a coarser texture than cotton. Linen is often used for works with textural solid elements, such as wall hanging or weaving techniques.
Wool	It is elastic, soft, and heat-resistant. Suitable for felting or making thick textiles such as rugs and small carpets.
Silk	Fabrics with a smooth and glossy texture are often used for classy artworks that require luxurious visual effects, such as wall hangings or tapestries.
Sintetis (Polyester, Nylon)	Synthetic materials have high resistance to wrinkles and moisture. This material is suitable for works that will be displayed outdoors or that require additional strength.
Denim	Thick and durable fabrics are often used to manufacture artwork that requires a strong structure.

2) Classification by Fabric Color

Fabric waste materials have different colors, so they need to be classified based on the needs that suit the idea of making fiber artwork. The colors of patterned fabrics or plain fabrics are grouped into dominant color categories, such as primary colors (red, yellow, blue), secondary colors (orange, purple, green), and tertiary colors (brown, ochre, red-ochre, brown-ochre, ochre yellow, dark brown), as well as black and white. The grouping of these colors facilitates the process of making fiber art, especially in compositions that are created according to artistic needs. Color is an important element in fiber art because it has a visual and emotional effect on the artwork. The use of color determines the aesthetics or beauty of a work of art and can also communicate a certain message, theme, or atmosphere. Warm colors (red, orange, yellow) create a feeling of warmth, enthusiasm, or energy. It is often used to describe cheerfulness, optimism, or warmth. Cold colors (blue, green, purple) are often associated with calmness, freshness, or peace. Neutral colors (white, black, gray, beige) are often used to balance or dampen other color effects. Neutral colors can give an elegant, simple, or clean impression.

Color can draw the viewer's attention to a specific part of the artwork or create an interesting visual contrast. Focusing on the use of striking or different colors from the background can draw the viewer's eye to certain elements or details in fiber art. Contrast combines opposing colors (black and white or red and green) to create an interesting visual tension. Color can create a visual harmony that brings together various elements in a piece of fiber art. Using a certain color scheme can create unity and balance in the work. Analog Color Scheme uses adjacent colors in a color wheel (*e.g.*, blue, green, and green) to create a harmonious and coherent look. Complementary Color Schemes use opposite colors on the color wheel (*e.g.*, red and green) to create a strong and attractive contrast. In addition to considering visual composition, fiber art creation techniques can also be used to manipulate the color of fabric waste materials. In textile design, the technique of manipulating color when producing textiles can be done by mixing fibers through weaving, color management through the dyeing process, and manipulation of yarn orientation [20]. The intuitive relationship between the elements of color and the environment prompted the artist to consider the unity of fiber art with the color of the environment during the creation process. This demands a deeper understanding of color psychology, perception, and spatial design in the context of fiber art [21].

3) Classification by Fabric Size

The size of a piece of cloth is also important in determining the type of work that can be made. Small pieces (< 10 cm) are typically used for details, accents, or small pieces of artwork, such as fabric

mosaics, patchwork, or quilting. Medium cut (10 - 50 cm), this size is often used for key elements in fiber artwork, such as fabric pieces for appliqués, pattern pieces, or cut bases. Large cut (> 50 cm), more flexible, and can be used for almost any type of fiber artwork, from the background to the main element that dominates the artwork.

3.2. Potential Use of Fabric Waste Materials in Fiber Art

Determining the potential use of fabric waste materials in fiber arts involves several steps and considerations that focus on the characteristics of the material, its availability, feasibility of use, and the environmental and social impact of its use. Each type of fabric has different physical and chemical characteristics, which will affect how the fabric can be used in fiber art. For example, cotton fabrics may be easier to paint or embroider, while synthetic fabrics may be more durable and elastic [22]. The original texture and color of the fabric can be a unique aesthetic element in fiber art. Fabrics with attractive patterns or textures can give dimension and depth to a work of art without requiring a lot of modification. Fabrics that are still strong and not too damaged are more suitable for use in artworks that require longer durability. Meanwhile, fabrics that are more fragile, or already damaged, may be better used for parts of the job that don't require strength or for techniques like collages. Determining the potential use of fabric waste should begin by identifying available material sources, such as leftover production from textile factories, used fabrics from households, or textile waste from second-hand clothing stores. Consistent availability of materials is essential to ensure a sustainable supply of fiber artwork [23].

The size and amount of fabric available will affect the type of artwork that can be made. For example, large pieces of fabric are more suitable for making large woven fabrics, while small pieces can be used for fabric mosaics or patchwork. Some types of fabrics are easier to cut, sew, or shape. For example, natural fabrics such as cotton and wool are easier to dye than synthetic fabrics that may require unique coloring materials. Assessing this ease of processing will help determine how easily the material can be integrated into the creative process [24]. Some fabric waste may contain harmful chemicals or health risks, such as asbestos fibers or harmful azo dyes in certain fabrics. Materials for potential health risks should be evaluated to ensure the safety of the artist and the product's end user. To find out the creative potential of fabric waste materials, creators need to experiment with various fiber art techniques, such as quilting, embroidery, crochet, weaving, or mixed media. This test can provide insight into how the material responds to various techniques and tools and how it can create the desired artistic effect [25]. Creating small samples or prototypes of works that use fabric waste materials can help assess materials' durability, flexibility, and aesthetic qualities in larger art projects.

3.3. The Process of Making Fiber Artwork

Fiber art is an art form that integrates practical function and aesthetic value. The characteristics of this art form are based on fibers as carriers of visual expression, which mainly include fiber materials, technology, design, and other factors used and reformed [8]. In making this fiber artwork, the researcher realizes ideas in the form of pure and applied artworks. These two categories of art each use different techniques as they adapt their creative ideas. For fine art, weaving and collage techniques are used, while applied artworks use patchwork, quilting, and appliqué techniques.

1) Textile Fiber Processing

The manufacturing process begins with textile fiber processing techniques that involve various steps and methods to convert raw fibers into ready-to-use textile materials (Table 2). This process can include processing natural fibers (such as cotton, wool, linen, or silk) and synthetic fibers (such as polyester or nylon).

Table 2. Textile Fiber Processing

Steps	Description
1. Cleaning 	The cleaning process to remove dirt can be done by several methods, including washing, brushing, or using a fibre separator. The fabrics are then collected and grouped to undergo the following process.
2. Combing	The process of combing the fibres until they are aligned. This helps to remove any clumps or lint that form during the cleaning process. In addition, it separates the shorter, coarser fibres from the longer, finer fibres.

Steps	Description
	
3. Filtering 	Filtration to remove short, coarse, and unwanted fibres. Filtration improves fibre quality by producing smoother, more uniform, and more durable fibres. The fibres that go through the filtering process will grow into finer and stronger threads.
4. *Spinning* 	Spinning is the process of converting fibres into yarn. The spinning process involves continuously twisting the fibres, resulting in a single thread that spins together to form a more robust, thicker thread.
5. Packing 	The packing process involves a packing machine, which packs the yarn into a dense, uniform bale. These bales are made of a particular fabric that is strong and durable.
6. Dyeing 	The process of dyeing textile fibres or yarns uses natural or synthetic dyes. Fibers or yarns are incorporated into a dye solution using dyeing methods. After colour dyeing, the fibres or yarns are dried and ready for use in the production of textile products.

2) Creation of Fiber Artworks with Weaving Techniques

The weaving technique is very expressive and uniquely characterizes the woven textile material. Fiber artists use various weaving techniques to fully express the textures and colors of different fiber materials, creating different sensations in their fiber works, both visually and tactile [7]. The creation of this fiber artwork uses a cross-weaving technique, which results in a diagonal pattern on the fabric. This weaving technique is used to create pure artwork in the form of wall decorations. This technique is more complex than the plain technique, but it results in a more flexible fabric with a distinctive texture that matches the character of a good artwork as an expression. The weaving stage with the cross technique begins with preparing a loom suitable for the cross technique, usually with more than two pedals or a heddle (a device for lifting warp yarns). Prepare warp yarn to be installed vertically as a weaving pad. Choosing the right weft yarn, both in terms of color and thickness, to create diagonal patterns and textures. The next step is to attach the warp yarn to the loom with the same tension and sort according to the cross-weave pattern. In this technique, warp threads will be lifted alternately in specific groups to create a diagonal pattern. Ensuring that each warp yarn is firmly attached to the loom to keep it stable during the weaving process. For the basic pattern of cross-weave, the arrangement of warp yarns is usually set to be raised in a 2/2 or 3/1 pattern. For example, in a 2/2 pattern, two warp threads will be lifted while the other two are fixed, and then this pattern will shift to the next row. Set the pedal or heddle so that each group of warp yarn can be lifted according to the desired pattern order. The weaving process is carried out by picking up and inserting the weft yarn and then inserting it horizontally between the lifted warp yarns. Using the space shuttle to facilitate this insertion process. To form a diagonal pattern, each time the weft yarn is inserted, change the group of warp yarns that are lifted according to the pattern (*e.g.*, forward one group). After inserting the weft thread, it is necessary to use a reed or whisk to compact the weft thread so that the weave pattern and texture look clean and neat. Repeat the insertion of weft threads and change the group of warp threads lifted according to the diagonal pattern. Ensuring that the tension of warp yarn and weft yarn is maintained so that the weaving results are consistent and neat. After weaving, the ends of the warp

threads are tightened with knots or seams so that the fabric does not unravel. If needed, the remaining threads on the edges of the fabric need to be cut. Finishing is done by checking the finish to ensure that the diagonal pattern looks consistent and neat. The cross-weaving technique results in a fabric with a distinctive diagonal pattern, providing a unique texture that is more flexible and elastic compared to the plain technique (Fig. 1).

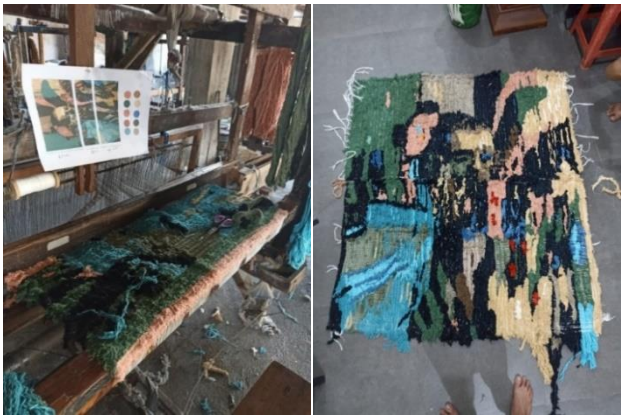

Fig. 1. Weaving with the cross technique according to the design pattern

3) Creation of Fiber Artworks with Collage Techniques

Creating fiber art with collage techniques involves combining different fibers or fabric materials to create a unique visual piece (Fig. 2). This technique combines pieces of fabric, thread, and other textiles that are glued or sewn onto the surface of the base to form the desired composition. This technique is used to create pure artwork as an aesthetic expression encapsulated in wall art decoration. The process starts with determining the concept or theme you want to raise in the fiber artwork. Inspiration can come from nature, everyday life, abstraction, or other visual elements. Once the concept is established, a sketch or rough design is created to help arrange the collage composition and the fabric's choice of color or texture. Once the sketch is complete, choose a fiber material that matches the design, such as cotton, linen, silk, or wool. Each type of material provides different textures, colors, and effects, so choosing a material is essential for creating visual contrast or harmony. The selected fabric material is cut according to the shape or size that matches the original design. These pieces can be geometric or organic shapes. The pieces of fabric are then arranged based on the design by paying attention to the composition, balance, and visual flow to be achieved. After the preparation is complete, pieces of fabric are glued or sewn to the base. Techniques used include glue-gluing, hand stitching using thread and needles, and sewing machines to speed up the process, especially for gluing large pieces. Finishing is done by adding other techniques and materials, such as embroidery, beads, or other decorative elements, to give the piece a sense of dimension and depth. The final check is carried out by reviewing the details of the paste to ensure that all elements are well attached and in accordance with the initial concept.

Fig. 2. Application of collage techniques and results

4) Creation of Applied Artworks

The creation of applied artworks is focused on practical and aesthetic functions. Inspiration can come from practical needs, lifestyle, or trends in interior design. Materials such as natural fibers (such as cotton, wool, silk, and hemp) or synthetic fibers (such as polyester and nylon) are selected based on aesthetics, functionality, and durability. This applied artwork uses patchwork, blankets, and appliqué techniques. The patchwork technique is one of the techniques that combines several pieces of fabric into a larger fabric. Patchwork is the art of sewing skills that combine patchwork pieces by hand or machine according to the desired pattern. The features of the patchwork technique lie in how the fabrics are combined. The basic shapes of patchwork pieces with the patchwork technique are geometric shapes such as triangles, squares, rectangles, parallelograms, circles, pentagons, and diamonds, see Table 3.

Table 3. Types of patchwork patterns used in creating applied artwork.

Pattern	Description
 Double Nine Patch	A combination of rectangular patterns arranged in such a way that they resemble a chessboard pattern. Using a combination of two types of patchwork patterns with a combination of soft and matching colours.
 Pinwheel	The combination of a triangular pattern with plain and patterned fabrics is arranged in such a way that it looks three-dimensional, resembling the shape of a windmill.
 Clay's Choice	Combining two triangular shapes with a rectangular pattern uses a combination of plain and patterned fabrics arranged to resemble a propeller.
 Dresden Plate	A combination of sixteen longitudinal pentagonal patterns with a circle in the middle, using nine different fabric patterns.
 Card Trick	A combination of several forms of triangular patterns with a combination of colours and motifs of the same fabrics arranged so that they appear to overlap.
 Lemoyne Star	The combination of diamond pattern shapes is arranged in such a way that it resembles the shape of a star, using a combination of two different fabric motifs of the same colour.

The application technique (appliqué means to paste, put, or install) is the art of forming an image from a piece of fabric and attaching it to its surface using hand or machine stitching. The quilting technique creates decorations on an object by filling the decorated part with foam, cotton, and thread to get the effect arising from the decoration. Sewing and quilting are the key to all patchwork craft products, Fig. 3. To form a single unit, the quilting process is to sew a three-layer pressing technique: the top layer, the silicone (dacryon), and the bottom layer (base).

Fig. 3. Motifs with application techniques and quilting techniques

From applying some of the techniques mentioned above, applied artworks with practical functions in various forms, such as bags, tablecloths, pillowcases, and bags, Fig. 4.

Fig. 4. Bag

The top patchwork bag features a structured ethnic pattern with bold geometric patterns and decorative elements that add a unique touch. This bag product is made of patchwork and fabric waste fibers and has a unique and eco-friendly appearance with various colorful fabric patches sewn together. Tablecloth products are made of patchwork and natural fibers (Fig.5). This piece blends multi-patterned fabrics with natural fibers, creating a unique and textured look. The round tablecloth design is made of patchwork, with an attractive circular pattern and lacy lace fringe for a vintage touch.

Fig. 5. Tablecloths

The chair cushions are made using fiber art techniques such as patchwork and quilting (Fig. 6). The piece features a patchwork design that blends colorful fabrics and natural fibers, creating a unique and textured look. The piece shows a textured patchwork design that features a combination of fabric and fiber, giving it a unique and rustic feel.

Fig. 6. Chair Cushion

. The bag design is made of patchwork and fabric waste fibers, incorporating a variety of fabrics and decorative elements for a unique and eco-friendly look. This design has a zipper closure at the top and visible stitching details (Fig. 7).

Fig. 7. Pouch

3.4. Analysis of Fiber Artworks Through Aesthetic, Artistic, and Ergonomic Approaches

Analysis of fiber artworks through aesthetic, artistic, and ergonomic approaches can provide in-depth insights into how they function and communicate visually, conceptually, and functionally.

1) Aesthetic Approach through Visual Composition

Visual composition is an approach that can be applied by involving elements such as colors, textures, patterns, and shapes. In fiber art, colors, textures, shapes, lines, and patterns are essential in creating a unique visual impression and aesthetic experience for connoisseurs. These elements and their impact on harmony, contrast, and visual perception are used. Matching colors or in a palette can create a coherent and calming impression. For example, soft pastel colors often create a calm and harmonious atmosphere. Using contrasting colors, such as complementary color combinations, can create a dynamic and energetic effect. This contrast draws attention and focuses on a specific part of the work. Similar or subtle textures can provide a sense of unity in the work, creating a seamless and harmonious experience when viewed or touched. Striking texture variations, such as a combination of fine and coarse materials, can provide depth and tactile appeal and enhance the uniqueness of the work. The arrangement of visual composition on fabric waste materials provides a creative and innovative experience because some materials already have different visual motifs and textures, so there are new challenges to come up with aesthetic forms. Complementary shapes or repetitions of similar shapes can create a harmonious visual rhythm, often giving a sense of order and attachment to the design. The extreme use of different shapes, such as a combination of organic and geometric shapes, can add visual dynamics and stimulate the viewer's perception to think about the relationships between the elements. Soft, flowing lines can provide a sense of continuity and calmness, guiding the connoisseur's eye in an orderly manner. Sharp lines or contrasting angles can create tension and energy in a piece, often used to draw attention to a specific area or to frame important elements. Repeating and regular patterns often create a sense of stability and calm, giving a pleasant and easy-to-understand impression. Random patterns or changes in scale, color, or shape can create greater visual interest, challenging viewers to engage more deeply with the work. Using these elements in fiber art influences how the connoisseur understands the work. The harmony in these elements can provide a calming and coherent experience, allowing connoisseurs to experience the overall beauty. Conversely, contrast can stimulate thoughts and emotions, encouraging viewers to take a closer look and think about the meaning or narrative behind the work. As such, the creator of the fiber artwork can deliberately arrange these elements to direct perception, create a layered visual experience, and elicit a specific emotional response from the viewer.

2) Artistic Approach

In analyzing fiber artworks, technique and media are two important aspects that give a work its own character and uniqueness. Analysis can be emphasized on the use of techniques to create the work (*e.g.*, weaving, sewing, patchwork, quilting, appliqué) and its contribution to the artistic uniqueness of the work. In addition, the media or materials used, such as yarn, fabric, or natural materials, are also important to analyze. The weaving technique is the process of crossing warp yarn and weft yarn to form a fabric. Weaving allows for the creation of intricate motifs and patterns as well as variations in fabric thickness and texture. For example, in wall artworks that have been made, weaving techniques are able to bring out interesting and artistic visual texture effects. Weaving techniques are

often used to produce traditional fabrics with a certain cultural meaning, thus providing high artistic and historical value. Sewing techniques are essential in the creation of fiber artwork, which involves joining two or more pieces of fabric using thread and needles. This technique can form the basic structure of a textile piece and add details such as folds, cuts, and shapes that contribute to the overall aesthetics of the design. For example, in applied artworks that have been created, sewing techniques are able to provide artistic visual effects that can beautify the motifs and shapes of the product. The appliqué technique is a technique that combines various pieces of fabric or fiber materials to create a unique, often colorful, and textured composition. This technique also helps fiber art creators process textile materials in small pieces, arranged and pasted into a complete work. This technique provides a high degree of artistic freedom because it combines various materials, colors, and motifs into a harmonious or contrasting composition according to the purpose of expression. The type of yarn used, be it wool, cotton, silk, or synthetic, affects the piece's texture, strength, and final appearance. For example, silk yarn provides luxurious shine and smoothness, while wool yarn provides warmth and a rougher texture. The choice of fabric as the main medium is very important in the creation of fiber artworks. Cotton fabrics, for example, are easy to dye and comfortable to wear, while silk fabrics provide elegant shine and smoothness. Synthetic fabrics are used for functional purposes due to their durable and easy-to-care properties. Additional elements such as beads and buttons are also used in the work of bags and chair cushions. These elements can add aesthetic value and exclusivity to the work and provide a three-dimensional touch that enriches the visuals and textures of the work. The techniques used in making textile works contribute greatly to the artistic uniqueness of the work because each technique brings uniqueness in terms of texture, pattern, and creative process. In addition, the choice of media or materials can enrich the concept and meaning of the work. For example, silk threads in embroidery can create a luxurious and delicate visual effect. In contrast, traditional weaving techniques can bring cultural and historical nuances into the work. Thus, techniques and media are not only tools for creating visual works, but also important elements that shape the artistic identity and meaning of the work. From an artistic perspective, fiber art is a medium that is rich in expression and allows creators to express ideas and emotions freely. Techniques such as weaving, sewing, knitting, embroidery, and collage allow creators to explore unique shapes and motifs. This makes fiber art a decorative work and a purely artistic medium of expression, with the freedom to combine traditional techniques with contemporary innovations that create works of high artistic value.

3) Ergonomic Approach

Fiber art has duality in its function as a pure work of art and as an object with practical uses. Ergonomic analysis should assess whether the piece has practical uses and how its function affects the overall design. In the context of ergonomic analysis, there are several aspects to consider when assessing its functionality and usability, such as practical use, functional influence on design, scalability, and practicality. Fiber art used as an interior element or home décor considers aspects of comfort, flexibility, and durability as the main factors. The design should allow for good mobility and provide protection or comfort that suits its purpose. The strength of the material and its resistance to daily use are essential. In addition, aesthetics must also be considered to fit the environment in which the product is placed. For example, cushion chairs and tablecloths have functional aspects related to the material's ability to absorb sound or add warmth to the room. Functional works tend to have limitations in design, as they must consider ergonomic aspects such as size, shape, and materials. For example, tablecloths and chair cushions that are enough for comfort are not too thick, so they are easy to clean or move. On the other hand, wall art will be more accessible when exploring shapes, colors, and techniques because functional requirements do not limit them. However, it is still important to consider how the work interacts with the surrounding environment. In ergonomic analysis, assessing the balance between function and aesthetics is essential to understanding how fiber art can achieve its goals. Interaction with users is also an important consideration when creating fiber art. The resulting fiber artwork has been designed with the user's comfort in mind. Works that interact with the body or space if intended for use have considered comfort and longevity When evaluating a work, especially those designed to be used or worn, it is important to consider several aspects of interaction with the user, including the comfort of the user, the interaction of the body or space, and the materials used. Does the work design pay attention to ergonomic aspects, such as ease of use and comfort when wearing or using? For example, the design of the bag as a fashion accessory allows free movement when used, and the material is comfortable on the skin. How does the work interact with the body or the space around it? For example, for interior element products, the size has been adjusted to the user's

space. Does the material chosen for the interior withstand long-term use, and does it require special care? Like home décor textile products in general, the material used to make this fiber artwork is durable and does not require special care. Overall, the designed fiber artwork has considered all these aspects to ensure users feel comfortable, safe, and satisfied with their interactions with the product.

Scalability and practicality also need to be considered to know how practical the work is to be produced on a larger scale or in the context of its use. Scalability and practicality are two important aspects to consider when designing a piece, especially if the piece is intended to be produced on a large scale or for use in everyday contexts. Scalability refers to the ability of a piece or design to be produced in large quantities without sacrificing quality or efficiency. Key considerations include production processes, materials and resources, and logistics. Considering scalability and practicality, fiber artwork can be more accessible for mass production and more relevant to consumers, increasing their chances of success in the market. By incorporating this approach, fiber art analysis can be more comprehensive, encompassing aesthetic and artistic aspects that enrich the meaning of the work, as well as ergonomic aspects that ensure its relevance and functionality in the context of use. From an ergonomic point of view, fiber art applied to functional objects must consider comfort and ease of use. This ergonomic aspect ensures that the fiber artwork is aesthetically and artistically comfortable, safe, and tailored to the user's needs. The materials and techniques chosen in fiber art should be adapted to their practical functions, such as the comfort of the fabric for fashion or flexibility in interior decoration.

3.5. Market Opportunities for Fiber Artwork

The market opportunity for fiber artwork from fabric waste materials is quite promising, especially with the increasing public awareness of sustainability and the environment. Using textile waste as the basic material for the creation of fiber art presents its own uniqueness while supporting the waste reduction movement. Many consumers now tend to opt for eco-friendly products, including artwork. Processing textile waste into works of art provides added value because it prioritizes the concept of sustainability. Fiber artwork from textile waste is unique, as textile waste has a variety of colors, textures, and patterns. This uniqueness is a special attraction for collectors and art lovers who want to have a different work. Art products from textile waste are also suitable for interior decoration and are elements in the fashion industry, such as accessories or additives. Along with the increasing trend of sustainable decoration and the use of eco-friendly fashion, this product can become an option for a wider market. The concept of waste reduction provides increased economic value, which will be a driving force for a sustainable future, but businesses are only beginning to realize it, perhaps due to a lack of resources and knowledge on how to implement these sustainable products. With constant news updates through technology and the competitiveness of social media, it is necessary to design and launch unique products that attract attention [26]. Many government programs, NGOs, and environmental organizations support sustainable creative industries. Artwork from textile waste is also often used for social campaigns or environmental education, which attracts the attention of institutions or individuals concerned with environmental issues. The international market is highly interested in developing countries' sustainable art products. This opens up opportunities for the export of artwork from textile waste to the global market, which may have a higher selling value. Therefore, in running this business, it is necessary to have a strong marketing strategy to demonstrate its sustainability value.

4. Conclusion

This article concludes that the creation of fiber artworks using fabric waste materials has great potential as a solution for handling textile waste in Surakarta. In line with the research objectives, several fiber arts have been produced using fabric waste materials through weaving, collage, and patchwork techniques. The creation and innovation of the resulting fiber artwork shows that fabric waste materials have great potential to be explored and developed into art products. Fabric waste materials that vary in terms of texture, color, and type of fiber allow for the creation of unique and interesting works of art. In addition, fabric waste in fiber art can reduce production costs because the raw materials used are cheap and easy to obtain. The use of fabric waste as the basic material of fiber art can reduce the volume of textile waste disposed of in landfills, thereby reducing environmental pollution. On the other hand, this approach also has a positive social impact, such as increasing public awareness of the importance of recycling and environmental sustainability. In addition, research on the creation of fiber art from fabric waste also opens new job opportunities for the community. In addition to reducing waste volumes, these initiatives also offer significant economic, social, and

environmental benefits. This product can be marketed as a unique and environmentally friendly item, appealing to consumers who care about sustainability issues. The market potential for fiber art products from fabric waste is increasing, which is in line with consumer interest in environmentally friendly and sustainable products. Thus, this approach provides solutions to environmental problems and improves social welfare. Despite material processing and consistency challenges, the potential for local community empowerment and creative economy development makes this approach feasible to continue to develop. However, this research still has some limitations and challenges. The limitation of material variation and inconsistency is that fabric waste comes from different material types and has different textures, absorbency, and strength characteristics. Limitations in the standardization of colors, patterns, and thicknesses because fabrics come from different sources. Limitations in processing techniques because not all types of fabrics are suitable for certain fiber art techniques (*e.g.*, synthetic fabrics are difficult to reweave or stitch with patchwork). Too-thin or damaged fabrics can be easily torn if processed with fiber art techniques such as embroidery or quilting. Challenge aesthetic values; Not everyone considers fiber art from fabric waste to be a high-quality product, especially if recycled materials are proven in their composition. An innovative design strategy is needed so that the product's appearance remains attractive and has high artistic value. Challenges in market acceptance: There is still a stigma that products from textile waste have a lower value than second-hand goods. The price of fiber art from fabric waste can be higher than ordinary textile products because it requires manual curation, cleaning, and production processes. Not everyone understands the uniqueness and meaning behind waste-based fiber art, so consumer education is needed. Despite these limitations and challenges, the potential for local community empowerment and creative economy development still needs to be encouraged so that this research can continue to be developed. This study recommends several steps to further develop the utilization of fabric waste in fiber arts in Surakarta, including: (1) increasing partnerships between artists, local communities, the government, and the private sector to support access to raw materials and market opportunities, (2) collaborating to build a structured fabric waste collection system by providing fabric waste banks in industrial centers or MSMEs to be distributed to fiber artists, (3) developing environmental awareness campaigns through education and training by integrating waste-based fiber art into the school curriculum, (4) holding fiber art workshops from waste and organizing textile culture festivals to reach a wider audience, (5) expanding marketing networks through digital platforms and e-commerce.

Acknowledgment

The author would like to thank the Art Education Study Program, Universitas Sebelas Maret, Surakarta, for the support of facilities and opportunities provided during the research process. This article is the result of research supported by the 2024 Arts and Culture Innovation Program grant organized by the Directorate of Innovation and Downstreaming, Universitas Sebelas Maret, Surakarta. The author also expressed his appreciation to all parties who have contributed to providing very meaningful materials, conceptual discussions, and technical support during the implementation of this.

Declarations

Author contribution	**:**	The first author contributes as the main contributor in the preparation of the research idea and result, while the second author, as a companion contributor, completes the supporting data and theories for this paper. All authors read and agree to the final paper.
Funding statement	**:**	This work was funded by the 2024 Arts and Culture Innovation Program, managed by the Directorate of Innovation and Downstreaming, Universitas Sebelas Maret, Surakarta.
Conflict of interest	**:**	The authors declare no conflict of interest.
Additional information	**:**	No additional information is available for this paper.

References

[1] M. Paranjape and A. Athalye, “Fashion Technology & Textile Engineering Textile Waste Management-Innovative Separation Techniques,” *Curr. Trends Fash. Technol. Text. Eng.*, vol. 9, no. 2, pp. 1–9, 2024, doi: 10.19080/CTFTTE.2024.09.555757.

[2] N. Nuryati, D. N. Mastuti, H. Hariyanti, M. Sulistyowati, and N. Herawati, “Pelatihan Dan Pendampingan Daur Ulang Limbah Perca Batik Menjadi Kalung Cantik Pada UMKM Dan Masyarakat Di Surakarta,” *Wasana Nyata*, vol. 7, no. 1, pp. 30–38, 2023, doi: 10.36587/wasananyata.v7i1.1456.

[3] M. A. Burhan, A. Anusapati, and L. L. D. Morin, "Instalasi Eco Art Sebagai Media Kultivasi Mikroalga," *Panggung*, vol. 31, no. 1, 2021, doi: 10.26742/panggung.v31i1.1539.

[4] S. Himmelsbach, "Sustainable Change: Recycling Strategies in Contemporary Art Practice," *ETC*, vol. 88, pp. 18–19, 2009.

[5] A. R. Jones and P. Stallybrass, *Renaissance clothing and the materials of memory: Introduction*. 2017. doi: 10.4324/9781315094151-8

[6] Z. Wang and Y. Ma, "Study on the Semantic Expression of Woven Fiber Art Decoration," *Proc. 2021 5th Int. Semin. Educ. Manag. Soc. Sci. (ISEMSS 2021)*, vol. 571, no. Isemss, pp. 45–48, 2021, doi: 10.2991/assehr.k.210806.010.

[7] W. Huang, "Contemporary Texture Representation in Fiber Art," *Adv. Educ. Humanit. Soc. Sci. Res.*, vol. 7, no. 1, p. 573, 2023, doi: 10.56028/aehssr.7.1.573.2023.

[8] G. Luo, "The Application of Contemporary Fiber Art in the Construction of Plastic Art Space," *Proc. 7th Int. Conf. Arts, Des. Contemp. Educ. (ICADCE 2021)*, vol. 572, no. Icadce, pp. 188–192, 2021, doi: 10.2991/assehr.k.210813.033.

[9] A. Pramono, B. Azis, T. I. W. Primadani, and W. W. Putra, "Penerapan Upcycling Limbah Kain Perca Pada Kursi Flat-Pack," *Mintakat J. Arsit.*, vol. 23, no. 1, pp. 14–27, 2022, doi: 10.26905/jam.v23i1.6075.

[10] M. F. Ahmed and G. A. Alamry, "Combining Hand Printing and Patchwork Techniques to Create Printed Artefacts Based on Natural Forms for Sustainable Development," vol. 23, no. July, pp. 48–71, 2024.

[11] H. S. Gurisik, "An Exemplary Project for the Sustainability of High Design Value Added Products by Using Textile Wastes," vol. 4, no. 1, pp. 316–324, 2022.

[12] M. D. Stanescu, "State of the art of post-consumer textile waste upcycling to reach the zero waste milestone," *Environ. Sci. Pollut. Res.*, vol. 28, no. 12, pp. 14253–14270, 2021, doi: 10.1007/s11356-021-12416-9.

[13] A. Burns, "Rethinking Fabric: The Application of Fabric Manipulation Techniques in Fashion Design Education," *Int. J. Art Des. Educ.*, vol. 41, no. 1, pp. 66–80, 2022, doi: 10.1111/jade.12375.

[14] B. Di Mattina, "Private to Public: The Role of Architects in the Emergence of Textile and Fibre Art in Australia," *Fabrications*, vol. 00, no. 00, pp. 1–24, 2024, doi: 10.1080/10331867.2024.2347006.

[15] R. Twist, *Fiber Arts Now : Exhibition Catalog Fiber Arts Now : Exhibition Catalog*. Pacific University Library, 2012.

[16] R. G. Harland, "Graphic design studies: what can it be? Following in Victor Margolin's footsteps for possible answers," *DRS2020 Synerg.*, vol. 2, pp. 586–600, 2020, doi: 10.21606/drs.2020.372.

[17] L. Candy and E. Edmonds, "Practice-based research in the creative arts Foundations and Futures from the Front Line," *LEONARDO*, vol. 51, no. 2, pp. 111–117, 2018, doi: 10.1162/LEON.

[18] R. L. Skains, "Creative Practice as Research: Discourse on Methodology," *Media Pract. Educ.*, vol. 19, no. 1, pp. 82–97, 2018, doi: 10.1080/14682753.2017.1362175.

[19] P. Dallow, "Representing creativeness : practice-based approaches to research in creative arts," *Art, Des. Commun. High. Educ.*, vol. 2, no. 1, pp. 49–66, 2003. doi: 10.1386/adch.2.1.49/0

[20] M. Kooroshnia, D. Dumitrescu, and J. Rijkers, "The influence of colour mixtures on the textural perception of surface design: Deciphering textile methodology in the field of bioplastic design," *Color Res. Appl.*, vol. 46, no. 3, pp. 546–556, 2021, doi: 10.1002/col.22648.

[21] N. Wang, S. Z. Abidin, N. Shaari, and N. Mansor, "Exploring Innovation in Visual Language of Modern Fiber Art within the New Media Landscape," *Asian J. Res. Educ. Soc. Sci.*, vol. 5, no. 3, pp. 177–183, 2023, doi: 10.55057/ajress.2023.5.3.19.

[22] L. Shen, J. Haufe, and M. K. Patel, "Product overview and market projection of emerging bio-based plastics," *Gr. Sci. Technol. Soc.*, no. June, p. 41, 2009.

[23] A.-A. Rusu, "Traditional textile art between sustainability and economic growth," *Rev. Appl. socio-economic Res.*, vol. 1, no. 2, pp. 160–166, 2011.

[24] A. K. R. Choudhury, *Environmental impacts of denim washing*. Elsevier Ltd, 2017. doi: 10.1016/B978-0-08-102043-2.00003-4

[25] R. M. Valianti, N. D. Lestari, M. Kristiawan, S. Danim, and R. N. Sasongko, "Utilization of waste fabric as a learning media to grow students' entrepreneurial soul," *JPPI (Jurnal Penelit. Pendidik. Indones.*, vol. 8, no. 1, p. 116, 2022, doi: 10.29210/020221611.

[26] D. Moorhouse and D. Moorhouse, "Sustainable Design: Circular Economy in Fashion and Textiles," *Des. J.*, vol. 20, no. sup1, pp. S1948–S1959, 2017, doi: 10.1080/14606925.2017.1352713.