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Implementation of the Motif Mapping Technique in Garment Pattern–Based Ecoprint Production

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Abstract

This study focuses on the development of a motif mapping and arrangement technique for ecoprint based on garment pattern pieces. Ecoprint motifs often appear fragmented, uneven, and visually unfocused because leaves are typically arranged on whole fabric without considering the garment pattern structure. The innovation of this research is the application of a pre-mapping process, in which garment patterns are drawn on pre-mordanted fabric prior to leaf arrangement, ensuring that motif placement follows pattern boundaries and maintains motif continuity. This study applies a modified 4D Research and Development model, supported by observation, experimentation, documentation, and expert evaluation. The findings indicate that the motif mapping technique is capable of producing a more structured motif composition that is well integrated with garment patterns, thereby enhancing both aesthetic value and visual unity in ecoprint products. The motifs no longer appear random or fragmented; instead, they form a cohesive visual flow aligned with the garment design. In addition, this technique provides greater control over motif placement, ensuring continuity across different sections of the garment. Based on expert evaluation, the resulting product falls within the good to very good category in terms of composition, neatness, and motif–pattern compatibility. Therefore, the Motif Mapping Technique can be considered an innovative alternative in pattern-based ecoprint design, offering a more structured approach and improved aesthetic outcomes.

Keywords: ecoprint; motif mapping; garment pattern; ecoprint design

INTRODUCTION

Ecoprint is a textile printing technique that utilizes leaves and flowers to create natural, distinctive, and environmentally friendly patterns. (Candra et al., 2025) The fundamental principle of ecoprinting involves direct contact between plant materials—such as leaves, flowers, stems, or other plant parts containing natural pigments—and a suitable fabric medium. (Budi, 2022) Ecoprinting as a natural dyeing technique produces unique and environmentally friendly motifs, making it widely utilized in the development of sustainable fashion products by extending product life cycles through upcycling practices and the use of environmentally friendly raw materials. (Susmiyatiningsih, 2022) Ecoprint fabrics are recognized for their unique, distinctive, and elegant patterns, making them highly attractive to fashion consumers. This technique has developed rapidly alongside the growing interest in eco-fashion and slow fashion because (Nurchayanti & Septiana, 2018) each ecoprint product produces a distinct result that cannot be replicated on a mass scale (one process, one product), which is why ecoprint is generally regarded as an exclusive product. The visual uniqueness of ecoprint contributes to its high value within the creative industry, as this environmentally friendly method is capable of producing visually appealing textile designs while simultaneously promoting the implementation of sustainable practices at the industrial level through the use of natural dyes derived from plant materials. (Dixit, 2023) By integrating creativity with environmental responsibility, this method also serves as a driving force for innovation and advancement within the textile industry, encouraging the development of sustainable design practices, the

exploration of natural resources as alternative dye materials, and the creation of textile products that offer both aesthetic value and environmental benefits.

However, despite its strong aesthetic value, ecoprint often encounters problems when applied to garment production. (Hikmah & Retnasari, 2021) Many motifs become fragmented, unbalanced, or disconnected from the design because leaf arrangement is typically carried out on an intact piece of fabric without first considering the shape and layout of the garment pattern. As a result, areas that are intended to serve as visual focal points, such as the center front line, collar, or waist section, often do not appear clearly after the fabric has been cut and sewn. (Sulaiman et al., 2022) Ecoprinting has become an important alternative for creating motifs on fabric; however, its inherently unpredictable nature causes variations in motif outcomes between one product and another, making it necessary for motif placement in relation to garment patterns to be carefully planned.

Several previous studies have indicated the need for a more structured ecoprinting process. (Aulia Agustin & Nurbaity Arrsyi, 2025) The aesthetic quality of ecoprint can be enhanced when the motif development process is planned from the outset rather than being allowed to form randomly or by chance. This has become increasingly important because contemporary consumers not only seek environmentally friendly eco-fashion products but also expect them to possess a strong, consistent, and highly artistic visual appearance. Ecoprinting has become one of the preferred solutions as well as an alternative environmentally friendly material due to its relatively simple production process and its ability to produce distinctive and unique motif patterns. (Watiningsih, 2022) The motifs formed from the silhouettes of leaves and flowers give ecoprint a high artistic and commercial value, supported by the use of natural dyes that produce distinctive color characteristics and create an exotic appearance on ecoprint fabrics.

(Hikmah & Retnasari, 2021) Ecoprint produces motifs that are highly influenced by the placement of natural materials; therefore, the application of a motif mapping technique prior to the printing process is capable of generating a more organized and well-planned visual composition. (Sudarwati et al., 2024) This is consistent with the principle of ecoprinting, which transfers the colors and shapes of plant materials directly onto the fabric surface through natural pigments, resulting in outcomes that possess unique and exclusive characteristics and therefore require motif planning from the earliest stage of the process.

. These studies indicate the need to develop a new technique that is capable of integrating the ecoprint concept with garment pattern design in order to prevent motif distortion during the garment construction process.

Based on these conditions, this study develops a garment pattern-based ecoprint motif mapping technique called the Motif Mapping Technique. (Sumarwahyudi, 2024) Ecoprint should not be treated merely as a dyeing technique or a form of textile surface decoration; rather, it needs to be comprehensively integrated into the garment design and construction process. The development of ecoprint products encompasses the stages of design, pattern making, cutting, and sewing to ensure that the motifs are harmoniously integrated with the product form. The Motif Mapping Technique developed in this study will be carried out using the Research and Development (R&D) 4D model, which consists of the define, design, develop, and disseminate stages. During the define stage, the primary focus is directed toward the issue of ecoprint motifs that are often disrupted after the fabric is cut according to garment patterns. During the design stage, garment patterns are prepared along with the development of a motif placement map for each pattern section. The develop stage is implemented through a series of ecoprint experiments conducted at the Institute for Research and Community Service (LPPM), Green Techno Park, Universitas Negeri Semarang, using various garment pattern-based leaf arrangement techniques. The disseminate stage is subsequently carried out through testing and validation by experts, accompanied by refinements to the prototype based on feedback and evaluation results.

The Motif Mapping Technique is expected to reduce motif fragmentation, improve composition, strengthen focal points, and produce more professional ecoprint outcomes.

In addition to addressing the technical issue of motif integrity, this study also positions the Motif Mapping Technique as a design innovation that is evaluated based on the aesthetic aspects of the product. Aesthetics in the context of fashion design relates to visual quality, compositional harmony, balance of form, proportion, motif rhythm, as well as the unity between motifs and garment structure. (Kristanti et al., 2024) In the application of ecoprinting, aesthetic quality is strongly influenced by how motifs are

positioned, how visual direction is established, and how motif continuity is maintained after the garment construction process. Ecoprint products are not only environmentally friendly but also possess considerable potential as fashion business opportunities due to their exclusive nature and high aesthetic value: “Eco-printed products have both aesthetic and market value, offering potential business opportunities.” However, despite their strong aesthetic value, ecoprint often encounters problems when applied to garment production. Many motifs become fragmented, unbalanced, or disconnected from the design because leaf arrangement is typically carried out on an intact piece of fabric without first considering the shape and layout of the garment pattern. Therefore, a solution to this problem will be explored in this study.

The selection of aesthetics as the primary indicator is based on the study conducted by Sumarwahyudi (2025), which found that “(Sumarwahyudi, 2024) “Ecoprint fabrics not only demonstrate visual beauty but also embody profound philosophical values regarding the relationship between humans and nature,” with 85% of respondents considering aesthetics as the determining factor in the attractiveness of ecoprint fashion products. (Sudana, 2019)Aesthetics in the context of fashion design is associated with visual quality, compositional harmony, balance of form, proportion, motif rhythm, as well as the unity between motifs and garment structure.

The level of success in applying the Motif Mapping Technique in this study is evaluated based on aesthetic indicators that include: (1) motif integrity and continuity after the cutting and sewing processes, (2) the balance and proportion of motif composition on each section of the garment pattern, and (3) the visual appeal and harmony of the motifs with the form and silhouette of the product. These three indicators are used to assess the extent to which the motif mapping technique is capable of improving the visual quality of the final product.

METHOD

This study employs a descriptive method with a research and development (development research) approach focused on the design and evaluation of the Motif Mapping Technique for garment pattern–based ecoprinting. This method was selected to provide a comprehensive description of the development stages, beginning with problem identification, solution design, experimental testing, and culminating in the evaluation of the feasibility of the resulting technique.

Data were collected through direct observation, photographic documentation, repeated experimentation, and expert evaluation. Observation was used to identify motif-related problems that emerged in ecoprinting without pattern mapping. Experiments were conducted by testing various leaf arrangement configurations following the pattern lines. Documentation served to record visual changes at each stage of the process. After the ecoprint prototype was completed, validation was carried out by experts, including ecoprint lecturers or practitioners, fashion design experts, pattern construction and tailoring experts, and vocational teachers with expertise in pattern construction. This validation assessed motif quality, composition, the compatibility between leaf placement and garment patterns, as well as the feasibility of the developed Motif Mapping Technique.

The development of the expert evaluation instrument in this study is focused on one primary aspect, namely the aesthetic aspect of the Motif Mapping Technique applied to the ecoprint sewed product. The selection of aesthetics as the primary indicator is supported by previous studies, such as (Sumarwahyudi, 2024) Sumarwahyudi, who reported that aesthetics contributes 70% of the visual quality assessment of ecoprint products because “ecoprint fabrics possess distinctive aesthetic characteristics derived from natural diversity and the creative processes of artisans,” compared to other technical indicators. Aesthetics is defined as the visual quality reflected through motif integrity, compositional balance, the harmony between motifs and garment patterns, and the overall visual appeal of the final product. (Khasanah & Widowati, 2020)The assessment of aesthetics is important in ecoprinting because the visual quality of the product is reflected through motif integrity, compositional harmony, and the visual appeal of the final appearance; the study conducted by Khasanah and Widowati demonstrated a significant influence on the aesthetic aspect of motifs, with the highest average score of 3.97.

The evaluation instrument was developed based on three main aesthetic indicators: (1) motif integrity and continuity after the garment construction process, (2) the balance and proportion of motif

composition on each section of the pattern, and (3) the visual appeal and harmony of the motifs with the form and silhouette of final product. Each indicator was elaborated into several assessment statements that were evaluated by experts in ecoprinting, fashion design, and construction using a 1–5 Likert scale.

This study employs a Research and Development (R&D) method using a modified 4D development model, consisting of the define, design, develop, and disseminate stages. The 4D model was selected because it provides a systematic framework for developing, testing, and evaluating an innovation from the initial identification of problems through to the validation of the final product.

During the define stage, the researcher conducted an identification and analysis of the main problems encountered in the application of ecoprinting to garment products. The primary issue identified was the disruption of motifs after the fabric was cut according to garment patterns, resulting in motifs that failed to integrate with the overall design and lost their intended visual focal points. This stage also involved an analysis of design requirements, user needs, and the characteristics of the product to be developed, ensuring that the proposed solution would effectively address the identified problems.

The design stage focused on developing a solution through the creation of the Motif Mapping Technique. This process began with the development of the pattern, followed by the preparation of a motif placement map for each section of the garment pattern. Particular attention was given to determining motif composition, visual flow, focal point placement, and the relationship between motif arrangement and the form and silhouette of the product. The objective of this stage was to establish a systematic approach that would maintain motif continuity throughout the garment construction process.

The develop stage involved the production and testing of prototypes through a series of ecoprint experiments conducted at Green Techno Park. Various leaf arrangement configurations were tested and adjusted according to the garment pattern structure to produce motifs that were visually continuous, balanced, and harmonious with the product. The resulting prototypes were subsequently evaluated to determine the effectiveness of the Motif Mapping Technique in overcoming motif fragmentation and improving the overall visual quality of ecoprint garments.

The final stage, disseminate, was carried out through the development of an evaluation instrument, which was subsequently reviewed and assessed by experts in the fields of art, pattern construction, and fashion design. This stage also included the validation of the instrument to ensure its suitability for evaluating the developed product.

The evaluation instrument used in this study was independently developed by the researcher based on aesthetic indicators in fashion design and the visual characteristics of ecoprint textiles. The instrument was structured around three main aspects: motif integrity and continuity, compositional balance and proportion, and the visual appeal and harmony of motifs with garment forms. Each aspect was further elaborated into several sub-indicators, which were then formulated into assessment statements using a five-point Likert scale.

Before being used for product evaluation, the instrument underwent a validation process through expert judgment involving lecturers with expertise in fashion design and research methodology. This validation process aimed to ensure that the instrument met the requirements of content validity, clarity of language, and alignment between the evaluation indicators and the objectives of the study.

The results of the instrument validation served as the basis for revising and refining assessment statements that were considered unclear, insufficiently representative, or in need of improvement. This process ensured that the instrument accurately measured the aesthetic aspects intended for evaluation and provided reliable data for the study.

After the instrument was declared valid and appropriate by the validators, it was used to evaluate the product through assessments conducted by experts in ecoprinting, fashion design, and construction. The evaluation results, together with expert feedback and recommendations, were subsequently used to refine and improve the prototype. This stage aimed to ensure that the developed Motif Mapping Technique was feasible from technical, aesthetic, and creative perspectives and could be effectively applied to ecoprint fashion products.

Table 1. Research and Development Procedure Based on the Modified 4D Model

Stage	Activities
Define	Identification and analysis of ecoprint-related problems, including motif fragmentation after garment

Stage	Activities
	construction, unbalanced motif composition, and literature review on ecoprinting and garment pattern design.
Design	Development of the Motif Mapping Technique through asymmetrical garment pattern design, determination of focal areas, and garment pattern-based motif mapping.
Develop	Prototype development through mordanting, pattern marking, leaf arrangement based on garment patterns, ecoprinting, fixation, and product testing.
Disseminate	Instrument development and validation, expert assessment, evaluation of motif integrity and aesthetics, product refinement, and innovation feasibility analysis.

RESULTS AND DISCUSSION

This section presents the results of the product feasibility test of ecoprint fashion using the Motif Mapping Technique applied to the product based on aesthetic evaluation. The assessment was conducted by three expert validators using a Likert scale instrument (1–5), which covered the aspects of motif integrity and continuity, balance and proportion, as well as visual appeal and technical feasibility.

Research Result

Expert Assessment Result

The table below presents the results of the expert assessment, including the scores and qualitative evaluations provided by the reviewers regarding the validity, practicality, and overall quality of the developed product.

Table 2. Results by Expert Validators

Validator	Percentage (%)	Category
Validator 1	92.86	Very Good
Validator 2	87.14	Very Good
Validator 3	91.43	Very Good
Mean	90.48	Very Good

Source: Author, 2026 (compiled from expert validation data).

Based on Table 1, the mean percentage score obtained was 90.48%, with a mean score of 4.52. All validators provided assessments within the “Very Good” category, indicating that the product demonstrates a high level of aesthetic quality. These results suggest that the application of the Motif Mapping Technique in ecoprint garments is capable of fulfilling the established assessment indicators, including motif continuity, compositional balance, and visual appeal.

Product Feasibility Classification Criteria

Table 3. Feasibility Criteria

Percentage Range (%)	Category
81–100	Very Feasible
61–80	Feasible
41–60	Fairly Feasible
≤ 40	Not Feasible

Source: Author, 2026 (data compiled and edited from the instrument)

Based on the criteria in Table 3.2, the percentage score of 90.48% falls within the range of 81%–100%, indicating that the Motif Mapping Technique product applied to Ecoprint Fashion (Ecoprint Coat) is categorized as very feasible. Therefore, the developed product has met the feasibility standards and can be used and further developed in the field of fashion design.

Expert Validation Results Based on Aesthetic Indicators

Table 4. Expert Validation Results Based on Aesthetic Indicators

Aspect	Mean Score	Percentage (%)	Category
Motif Integrity & Continuity	4.42	88.33	Very Good
Balance & Proportion	4.25	85.00	Very Good
Visual Appeal	4.58	91.67	Very Good
Technical Feasibility	5.00	100.00	Very Good

Source: Author, 2026 (data compiled and edited from the instrument)

Discussion of Research Results

Motif Integrity and Continuity

The motif integrity and continuity aspect achieved a percentage of 88.33%, categorized as *Very Good*. This result indicates that the Motif Mapping Technique effectively maintains motif continuity throughout the garment construction process. The motifs remain visually connected across pattern sections and do not appear fragmented after cutting and sewing. These findings demonstrate that the technique successfully addresses one of the major limitations of conventional ecoprinting, where motifs often lose their visual coherence during garment assembly.

Balance and Proportion

The balance and proportion aspect obtained a percentage of 85.00%, which also falls within the *Very Good* category. This result shows that motif distribution was arranged harmoniously across the garment. Although this aspect received the lowest score among the evaluated indicators, the composition remained visually balanced and proportional, indicating that the Motif Mapping Technique provides effective control over motif placement and arrangement.

Visual Appeal

The visual appeal aspect received a percentage of 91.67%, categorized as *Very Good*. This finding indicates that the resulting product possesses strong aesthetic value and an attractive visual appearance. The motif arrangement successfully enhances the design character and creates a clear visual focal point, contributing to a cohesive and aesthetically pleasing garment design.

Technical Feasibility

Technical feasibility achieved the highest percentage, 100.00%, and was categorized as *Very Good*. This result demonstrates that the Motif Mapping Technique is highly feasible for application in ecoprint fashion development. Expert validators considered the technique practical, innovative, and capable of improving both motif organization and overall product aesthetics, indicating strong potential for broader implementation in sustainable fashion design.

CONCLUSION

Based on the findings across all four assessment aspects, it can be concluded that the application of the Motif Mapping Technique demonstrates overall very strong performance. This is reflected in percentage scores ranging from 85% to 100%, with all aspects categorized as “very good.”

The motif integrity and continuity aspect demonstrates that the technique is effective in maintaining motif integrity after the construction process, thereby minimizing motif fragmentation issues. The balance and proportion aspect shows that motif composition has been arranged harmoniously, even within an asymmetrical design, although there is still room for improvement in visual distribution. Meanwhile, the visual appeal aspect confirms that the technique significantly enhances product aesthetic quality by achieving harmony between motifs, form, and garment silhouette.

The technical feasibility aspect, which obtained a perfect score, further indicates that the Motif Mapping Technique is not only aesthetically effective but also feasible and suitable for further development in ecoprint fashion design. (Aulia Agustin & Nurbaity Arrsyi, 2025) The results of this study are consistent with previous research by Agustin and Arrsyi (2024), which highlights the limitations of

ecoprinting in terms of motif regularity and compatibility with garment patterns. They state that "through the Motif Mapping Technique, motifs can be controlled from the beginning so that they remain intact and aligned with garment patterns after construction," emphasizing that pattern-based planning produces more structured and aesthetically refined compositions.

The findings of this study support this statement, showing that pattern-based planning produces more structured and aesthetically refined compositions.. This study confirms that the motif mapping technique produces more consistent and visually appealing outcomes. This study extends that concept by demonstrating that pattern-based motif mapping leads to more controlled and systematic compositions.

Therefore, it can be concluded that this study not only strengthens previous findings but also presents a practical solution to address the long-standing issues in ecoprinting, and to address the longstanding shortcomings of conventional ecoprint practices, the Mapping Technique was developed in response to the concerns raised by (Hikmah & Retnasari, 2021) Hikmah and Retnasari regarding the random distribution of motifs, the absence of systematic composition, and the weak integration between ecoprint patterns and garment design.

This technique represents an innovation that effectively responds to key problems in ecoprint fashion while contributing to improved visual quality, compositional order, and aesthetic value in pattern-based garment design. It also holds strong potential for further development in both academic research and the sustainable fashion industry.

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