



Transforming *Wuku Gumbreg's* Symbolic Illumination from *Serat Pawukon* into Contemporary *Batik Printing* Bed Set

Transformasi Iluminasi Simbolik Wuku Gumbreg Serat Pawukon Menjadi Bed Set Batik Printing Kontemporer

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<https://doi.org/10.5614/sostek.itbj.2026.25.2.5>

Submitted: November 1, 2025 Accepted: June 1, 2026 Published: July 31, 2026

ARTICLE INFO

Keywords:

batik printing, Pawukon manuscript, contemporary design, bed set, cultural heritage

ABSTRACT

Indonesian batik as an intangible cultural heritage requires the development of innovative designs based on local wisdom. The *Pawukon* fiber, as an ancient Javanese manuscript, contains visual illumination of high philosophical value, equivalent to the Javanese horoscope, which describes human disposition through the symbol of the god. However, its potential as an inspiration for modern textile design has not been optimally exploited. This research aims to transform the illumination into a contemporary *batik printing* design for bed set products (bed sheets, pillowcases, and bolster sarongs) without sacrificing their cultural value. The methodology includes literature review, visual observation, design experiments, and prototype validation by cultural experts as well as industry practitioners. The result is a series of contemporary *batik printing* designs on satin fabric that have been validated. The conclusion of the study confirms that this transformation has succeeded in combining the values of tradition and modern aesthetics, thereby contributing to the preservation of culture and the development of high-value-added creative industry products.

INFO ARTIKEL

Kata kunci:

batik printing, serat Pawukon, desain kontemporer, bed set, warisan budaya

ABSTRAK

Batik sebagai Warisan Budaya Takbenda memerlukan pengembangan desain inovatif berbasis kearifan lokal. Serat Pawukon sebagai naskah Jawa kuno memuat iluminasi visual bernilai filosofis tinggi, setara dengan horoskop Jawa yang menggambarkan watak manusia melalui simbol dewa. Potensinya sebagai inspirasi desain tekstil modern belum tergarap secara optimal. Penelitian ini bertujuan mentransformasi iluminasi tersebut menjadi desain batik printing kontemporer untuk produk bed set (sprei, sarung bantal, sarung guling) tanpa mengorbankan nilai kulturalnya. Metodologi mencakup studi literatur, observasi visual, eksperimen desain, dan validasi prototipe oleh ahli budaya serta praktisi industri. Hasilnya berupa serangkaian desain batik printing kontemporer pada kain satin yang telah tervalidasi. Simpulan penelitian menegaskan transformasi ini berhasil memadukan nilai tradisi dan estetika modern, berkontribusi pada pelestarian budaya dan pengembangan produk industri kreatif bernilai tambah tinggi.

Introduction

Indonesian batik as an intangible cultural heritage requires not only preservation but also innovative development. The demand to continue to revive batik in the contemporary context encourages the exploration of new sources of inspiration that are still based on local wisdom. However, the development of contemporary *batik printing* designs today is often still limited to traditional motifs that are already common, such as Parang or Kawung. Most contemporary batik design products rely on the reprocessing of historical motifs through manipulation of aspects of proportion, repetition, or deconstruction of visual elements (Istiqomah & Amboro, 2024). Thus, innovations based on cultural sources that have not been widely explored are needed. Contemporary patterned batik represents a conceptual breakthrough in the realm of batik techniques (Wardoyo et al., 2019).

Contemporary batik is also an expression of today's textile art that often elevates and transforms traditional forms and local cultural elements into its motifs (Aini & Affanti, 2022). One of the potential sources of inspiration that has not been optimally worked on is the classic Javanese manuscripts, especially Serat *Pawukon*. As a dating system and a guideline for the life of the Javanese people, *Pawukon* is not only rich in philosophical values but also equipped with unique and meaningful illumination (visual decoration) for each *wuku* (Dhamastuty et al., 2018). The decorations in the *Pawukon* fiber contain gods, birds, trees, buildings, flags, water vessels, and weapons. Sometimes, they do not include images of all these elements, although the accompanying text states all of them and the characteristics they represent (Meij, 2019).

Wuku Gumbreg, as one of the 30 *wuku*, has distinctive characters, symbols, and visual illumination chosen to be transformed into an aesthetic element of modern textile design. On the other hand, the market for household products, especially bed sets (bed sheets, pillowcases, and bolsters), offers strategic opportunities as a medium for the application of cultural design. This product not only serves but also serves as a marker of the aesthetic and identity of its owner. Conventional batik emerges through graphic design and is specific to each area. This change has manifested a blend of classic and modern patterns in its visual elements (Wesnina et al., 2025).

The use of satin fabric media that has a sparkle and a luxurious impression can increase the selling value and visual appeal of the resulting batik design (Widyaningrum & Syamwil, 2022). Based on this background, this research seeks to bridge the wealth of tradition and modern markets by elevating the Fiber Illumination of *Pawukon Wuku Gumbreg* (ISPWG) as the main source of inspiration. The main problem of this study is, "How is the strategy to transform the visual and philosophical value of the *Pawukon Wuku Gumbreg* Fiber Illumination into a contemporary *batik printing* design format on satin fabric for bed set products without sacrificing its cultural value, while answering the aesthetic preferences of the modern creative industry market?" The main question includes three aspects: what visual and philosophical elements are contained in the ISPWG that can be extracted as a source of design ideas; how the creative process of transforming traditional illumination into contemporary *batik printing* designs; and the extent to which the resulting design prototypes are aesthetically acceptable and meet the tastes of modern consumers.

The purpose of this research is to transform ISPWG into a contemporary *batik printing* design on bed set products through the synthesis of traditional-modern aesthetics, maintaining philosophical and cultural integrity (ISPWG) in design adaptation, and meeting the preferences of the creative industry market. Through contemporary design approaches, the double diamond method, and digital printing technology, this research aims to create a batik design that is not only aesthetically and commercially viable but also maintains the philosophical and cultural integrity of its roots.

Literature studies show that illumination in ancient manuscripts, including the *Pawukon* fibers, is a decorative element that contains deep aesthetic value and cultural significance (Rosidah, 2018). In addition to serving as a decoration with ornaments such as *prada* (gold layer), puppets, and leaves, illumination also clarifies the text, complements the narrative, and reflects Javanese cultural values with

Hindu-Buddhist influences (Sulaiman & Bastian, 2020). These characteristics make it a potential source of inspiration for contemporary batik design.

In previous work, studies with a codicological approach have identified the illumination forms of Javanese manuscripts (puppets, leaves, and weapons) descriptively but have not explored their application to creative media such as batik. Similarly, philological studies focus on the analysis of the text and cultural context of the *Pawukon* fiber related to the Javanese calendar, without developing the visual aspect of illumination for the purpose of product design.

In the context of the development of batik technology, *batik printing* allows batik motifs to be digitally designed using graphic software before being printed directly onto the fabric with a special textile printer (Fauzi, 2023). This technique offers high precision and flexibility in modifying the design, despite the challenges of texture quality and color fastness compared to traditional batik (Wijaya, 2022). The presence of *batik printing* has opened new opportunities for the textile industry, especially in meeting the increasing dynamic market demand (Santoso, 2021a). Contemporary *batik printing* is the result of innovation that combines traditional techniques with modern technology, creating a more efficient and sustainable textile design (Wijaya et al., 2021).

This research develops the visual aspect of illumination as a source of contemporary *batik printing* design for bed set products. While previous work has limited itself to documenting the form and meaning of the manuscript, this study applies a design approach based on the double diamond method to create creative adaptations that blend traditional ornaments (ISPWG) with modern aesthetics while testing market acceptance.

Method

Research methods include literature and observational studies (ISPWG) for visual-textual data collection and design experiments through the process of transformation and stylization of illumination elements, as well as prototype validation by cultural experts and industry practitioners. The research frame begins with the exploration of the philosophy and visuals of ISP *Wuku Gumbreg*, followed by the creative transformation process through the double diamond method (discover, define, develop, deliver), and ends with the validation of the final product that tests the cultural, aesthetic, and commercial aspects of the contemporary *batik printing* design produced. Data were collected through a literature study of the *Pawukon* fiber manuscript and visual observation of the illumination of *Wuku Gumbreg*. Interpretive analysis is applied to uncover symbolic meaning and philosophical value, while visual analysis is used to identify basic visual elements.

This study does not treat the “Serat *Pawukon*” as a single, homogeneous entity. Based on direct observation, the study identifies two manuscript versions that differ in terms of codicology: Radya Pustaka Museum (MRP) version: A manuscript in the MRP collection with inventory code KP 171/3. This manuscript is in the form of a *lempiran* (long book) with colored illumination on pages 12–14. Its visual characteristics: the figure of the jungle fowl is depicted with fully spread wings and in a standing position; the banyan tree has hanging roots that extend to touch the fowl’s claws. The figure of *Betara Cakra* is not explicitly depicted; only a symbol (emblem) in the form of a water cup at the base of the tree is present.

Reksapustaka Mangkunegaran Palace (RPM) version: A manuscript from the RPM collection with the code MN. 341. The illumination takes the form of *wayang kertas* (flat figures in the *wayang* style). Characteristics: The banyan tree is stylized as a mountain, the jungle fowl is on the right in a crouching position, and *Betara Cakra* is explicitly depicted as a standing figure holding a water cup in the palm of his hand.

This study uses the MRP KP 171/3 version as the primary source for design transformation, based on the following considerations: (a) the richer set of visual elements available for distillation, and (b) the

museum's authorization to reproduce the image for scientific publication purposes. The RPM version was used as triangulation data to verify the consistency of symbolic meaning.

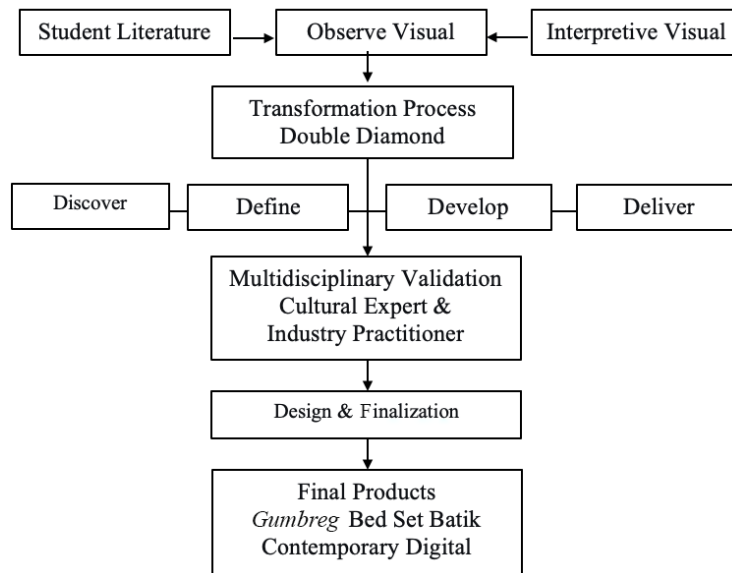


Figure 1 Research Method of Gumbreg of Digital Batik Printing
Source: *Wuku Gumbreg* Research Team 2025

The Design Process of Visual Transformation of Illumination into Contemporary Patterns

This creative process is designed as a bridge that connects traditional and modern aesthetics, converting classic, complexity-laden illumination into functional patterns relevant to the needs of contemporary textile design. The transformation begins with a deconstruction stage, in which each visual element in the *Wuku Gumbreg* illumination is analyzed semiotically to understand the philosophical meaning contained in its figurative forms, ornaments, and visual compositions. This multi-layered reading process is an important foundation before modernizing forms, ensuring that cultural values are not reduced even if the visual form undergoes a radical transformation.

Decomposition of Illumination Visual

At the stage of decomposition of the visual elements of the illumination, the process of dismantling and simplifying the initial form is carried out through three main approaches: decomposition, which analyzes and breaks down the original illumination of *Wuku Gumbreg* into the most basic forming visual elements to obtain a comprehensive picture of the visual structure of the manuscript; stylization which simplifies each separate element into more essential, flat, and graphic shapes by changing the shapes to be realistic or highly detailed; and transformations which digitally manipulate stylized elements to create figurative, semi-realistic objects, thus retaining traditional visual essence while adapting them into contemporary visual language.

Stylization of Illumination Visual Elements

The stylization stage of illuminating visual elements is the process of rearranging elements that have been transformed by applying contemporary design principles, where the focus lies on three fundamental aspects. The first aspect is a composition that arranges visual elements by considering the principles of balance, rhythm, and the use of negative space to create visual harmony. The second aspect is abstraction, where the final pattern does not have to represent the original illumination literally but rather emphasizes the conveyance of the impressions, emotions, or energy of *Wuku Gumbreg* through a nonrepresentational

arrangement that frees the design from the visual narrative entirely. The third aspect is the creation of seamless repeating patterns, where the pattern units that have been designed are specially arranged so that when replicated on a wide field of fabric, the connections between the units are not detected and form a harmonious and continuous visual surface, making it very suitable for bed set product applications.

Visual Ideas (Basic Draft)

It is a creative concept that guides the transformation of *Wuku Gumbreg's* illumination into contemporary design by elaborating key visual elements such as the curved and spiral shapes of symbolic figures to be simplified into abstract geometric shapes, then arranging them through the principle of repetition and asymmetrical balance with a neutral color palette combined with contemporary color accents, thus creating dynamic patterns that maintain the philosophical essence of Java while fulfilling the Javanese philosophical essence while fulfilling the modern interior design aesthetics.

It serves as the main creative concept that guides the process of transforming *Wuku Gumbreg's* illumination into a contemporary design form through three fundamental approaches. The first approach involves identifying and deconstructing key visual elements, such as curved and spiral shapes from traditional symbolic figures, and then simplifying them into more essential abstract geometric forms. The second approach applies the principles of repetition and asymmetric balance in arranging the elements of the abstraction, combined with the exploration of neutral color palettes and contemporary color accents to create visual depth. The third approach ensures the creation of dynamic patterns that maintain the Javanese philosophical essence while meeting the aesthetic needs of modern interior design, resulting in products that not only have artistic value but are also relevant to the contemporary context.

Contemporary Color Exploration

It is a critical stage that gives it a modern feel and determines the final visual appeal of the product through a comprehensive approach. This stage begins with the analysis of traditional colors to understand the symbolic meaning of the colors inherent in *Wuku Gumbreg* in the context of Javanese culture, such as the colors of the land that represent the basic elements of *Gumbreg*.

Furthermore, the development of a new color palette that is not limited to traditional batik color conventions is carried out, taking into account the psychological aspects of color to create a calm and comfortable atmosphere in the bedroom through the use of pastel colors, earthy tones, or monochrome schemes; adaptation to the latest interior design trends; a guarantee of contrast and harmony of colors to bring out pattern details; and ensuring production feasibility through accurate color reproduction capabilities in the digital printing process on satin fabric. Through this multidimensional approach, color transformation is not just modernizing the visual appearance but is a profound reinterpretation process that gives birth to an innovative design that remains rooted in local wisdom but can speak in today's visual language.

Prototype Validation

The resulting designs are validated by Javanese cultural experts to assess philosophical integrity and by industry practitioners to assess production feasibility as well as commercial potential. The research instruments include document analysis sheets, graphic design software, and validation questionnaires. The data analysis technique uses interpretive analysis for qualitative data and quantitative descriptive analysis for validation data. The result of the research is in the form of a contemporary *batik printing* design that has been tested for cultural and commercial feasibility.

Cultural Expert: Mr. K.R.T. Hardjonegoro, a senior cultural expert from Solo, gave full support to the *Wuku Gumbreg* illuminated digital printing bedset batik project as a form of progressive cultural dynamics, with the note that the philosophy must be maintained. He recommends the integration of meaning by making the *Parang* motif a channeler of *Gumbreg's* strong energy towards constancy; the

Kawung motif as the guardian of the purity of intention, like a pure seed; and adding the *Truntum* motif as a symbol of hope so that the resulting growth is full of love. The application of the bed set is considered appropriate to create a *srawung* environment or positive communication between residents and their cultural heritage every time they rest. In closing, he emphasized that the final design must be consulted again to ensure that this collaboration becomes a harmonious 'visual fairy tale' where *Pawukon* illumination is the story and batik motifs are the language, so that it is not only aesthetic but also meaningful.

From the perspective of industry experts, Mrs. Dian Paramita, director of PT Batik Modern Nusantara, welcomed this digital *batik printing* bed set project as a strategic breakthrough that brings cultural heritage directly to the contemporary market. He emphasized that this unique collaboration between Balinese and Javanese philosophies not only creates a strong unique selling proposition (USP) but also opens a premium market segment that appreciates the story and meaning behind a product. The application of bed sets is considered very appropriate, considering the trend of "affordable luxury" and awareness of home products that are personal and nuanced in wellness. To ensure commercial viability, she recommends the use of the best quality cotton fabric printing technology to capture the details of intricate motifs, as well as the creation of a strong brand story that contains a consultation process with these cultural experts so that cultural value is not lost but instead becomes the main marketing attraction that can significantly increase the value and selling price of products.

The process involves building and developing high-fidelity prototypes that simulate real-life user experience, conducting a series of iterative tests both in a controlled environment and with real users, and collecting qualitative feedback and quantitative data to ensure every aspect of the design is optimal.

Results and Discussion

Based on the findings of previous research, it is known that the *Pawukon* fiber not only functions as a timekeeper in the Javanese calendar system but also stores symbolic stories that are loaded with philosophical meanings (Widiastuti, 2018). *Pawukon* is a traditional calendar that uses 30 weekly periods (*wuku*), where each period lasts seven days. (Sidhartani et al., 2023).

Serat Pawukon

The visual study of illumination reveals that each *wuku* in the *Pawukon* system contains a cosmological narrative and life clues that are manifested through certain visual symbols. (Widodo et al., 2012). These symbolic stories can be embodied in various forms of symbols that represent stories, norms, and hereditary beliefs, as presented in the study of symbolism in ancient Javanese manuscripts (Darmoko, 2017).

The next stage of this research is to decipher the meaning of these symbols and translate them into the design of batik motifs. This creative process requires changing symbolic meanings into visual patterns that are ready to be applied to batik fabrics, which, of course, requires a deep mastery of batik techniques and art (Kementerian Pariwisata dan Ekonomi Kreatif RI, 2023). According to Handayani, the transformation of traditional motifs into contemporary design requires a comprehensive understanding of the meaning of indigenous culture and the ability to creatively reinterpret them. (Handayani & Prasetyo, 2023).

To support the efficiency and acceleration of the design process, digital devices will be used that facilitate the creation, editing, and refinement of batik motifs virtually. The digital platform offers a wide range of user-friendly design features, from setting visual elements to color and texture testing, allowing for more varied creative experimentation and more accurate results. As Perdana revealed, digital printing technology in the modern batik industry allows for high precision and flexibility in design modification (Perdana & Sari, 2022).

The use of digital technology in this study not only aims to protect the richness of traditional culture but also to present updates and adjustments of batik motifs to keep pace with modern developments. This digitalization approach is expected to increase production effectiveness while creating new opportunities

in the creative industry, especially in the *batik printing* and fashion textile design sectors. In line with Hidayat's research, contemporary batik innovation based on digital technology has proven to be able to open the global market through a more diverse and adaptive design variety. (Hidayat & Wulandari, 2023).

Batik Printing

The emergence of *batik printing* has created fresh opportunities for the industry, especially in meeting the changing market demands (Santoso, 2021b). Various modern fashion products, ranging from clothes to bags and accessories, now integrate many batik motifs through printing techniques, thus expanding the consumer segment. However, this development has also sparked concern among traditional batik artisans, who feel that the core cultural values of batik are beginning to erode. In response to this, it is necessary to educate the public about the fundamental differences between *batik printing* and traditional batik, as well as the importance of preserving conventional techniques as cultural heritage.

Contemporary *batik printing* represents an innovation that combines traditional techniques with technological advancements, resulting in more efficient and sustainable textile designs (Wijaya et al., 2021). Unlike the long manual process of written or stamped batik, digital printing allows for high-precision reproduction of motifs, reduces color waste, and shortens production time. Studies with a cultural heritage approach show that this digital adaptation not only preserves the uniqueness of batik motifs but also expands its reach to the global market through abstract and minimalist design variations (Wijaya, 2022).

Wuku Gumbreg

Wuku Gumbreg is one of the thirty wuku in the Javanese calendar system that contains deep philosophical value and rich visual symbolism. This study aims to analyze the philosophical elements, character, and visual representation in *Wuku Gumbreg* based on the manuscript of *Serat Pawukon*. The *Pawukon* fiber, a classic Javanese script, not only serves as a marker of time but also as a guide for life that contains deep moral and philosophical teachings (Widayat & Studyanto, 2018). *Wuku Gumbreg*, with its unique characteristics, represents the value system and outlook on life of the Javanese people that is still relevant today. This research is important to uncover the richness of local wisdom that can be a valuable source of inspiration in the development of culturally based contemporary design.

Wuku Gumbreg is under the protection of *Bathara Cakra*, a god who symbolizes power and authority in Javanese mythology. *Bathara Cakra* represents the concept of fair and wise leadership, reflecting the noble values that are upheld in Javanese society. The visual symbolism in *Wuku Gumbreg* contains a deep meaning (Mulyono, 1982). The banyan tree symbolizes protection and shade, representing a place of refuge and a source of strength in Javanese tradition. The pigeon represents courage and authority, symbolizing a figure who is respected but still humble. *Gedhong* on the left shows sincerity in action, reflecting the sacred intentions in Javanese philosophy. The water-soaked feet symbol depicts gentle yet firm leadership, reflecting a tough-looking attitude in front but attentive in the back.

The character of *Wuku Gumbreg* is described as an authoritative and influential person. The phrase "*Gumbreg geter wong tinuku abane*" indicates a respected figure whose orders are followed by subordinates (Purwadi, 2006). This character reflects the concept of ideal leadership in Javanese culture that emphasizes authority accompanied by responsibility. The philosophical meaning of *Wuku Gumbreg* contains profound teachings about authoritative yet caring leadership, a balance between strength and gentleness, sincerity in acting and making decisions, and the ability to provide protection and security. These values show the depth of Javanese cultural thinking by looking at the concept of leadership and social relations.

Wuku Gumbreg's visual elements have great potential to be adapted into contemporary batik designs. The banyan tree can be transformed into a main motif with modern stylization, while the symbol of the base chicken can be developed into a dynamic and meaningful pattern. Strong leadership character

can be realized through the composition of a bold yet elegant layout, reflecting the essence of *Wuku Gumbreg's* philosophy.

Double Diamond

This research and design adopts the double diamond theory initiated by the UK Design Council in 2005. The model was developed based on a comprehensive study of design processes in leading companies, with the contribution of important thinking from Richard Eisermann and Clive Grinyer in its development. This theory exists in response to the need for a systematic and structured design framework (Gustafsson, 2019).

The presence of the double diamond model aims to provide a clear and easy-to-understand visual framework for designers and other stakeholders. Through this approach, the design process can be effectively facilitated from initial concept to final implementation, with a special emphasis on two stages of critical thinking, namely divergence to broaden horizons and explore different possibilities, as well as convergence to narrow the focus and determine the best option. The process in the double diamond framework consists of four phases that are closely interconnected. The first phase is discovery or research, which focuses on discovering problems through research activities and data collection, resulting in documentation of findings that are still unstructured.

The second phase is “Defined” or “Synthesis,” where the findings from the previous stage are analyzed in depth to define the core of the problem, resulting in a clear problem formulation and solution development strategy. The third phase is “Developed” or ideation, which is the stage of developing solutions through various ideation and concept exploration methods, followed by evaluation to determine the most suitable concept. The fourth phase is “Delivered” or implementation, which is the stage of implementing the selected solution, including the process of refining prototypes, testing, and final production to ensure that the resulting solution effectively answers the problem.

Through the application of these four phases, the double diamond approach ensures a structured, iterative, and problem-solving-oriented design process that is conceptually and practically relevant. This model not only provides guidance in design decision-making but also ensures that each stage of product development has gone through careful and comprehensive consideration.

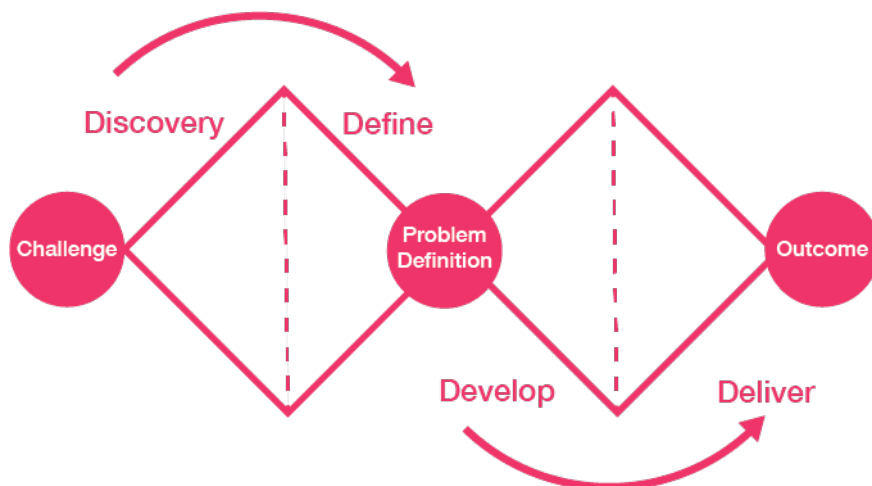


Figure 2 Four phases of the double diamond Model
Source: <https://mgearon.com/ux/double-diamond-model/>

Results and Discussion

It is also said that the discovery in the double diamond framework is a divergent opening stage, where the focus is to understand the context of the problem broadly and deeply rather than rushing to find solutions.

In this phase, researchers or designers conduct extensive exploration through various qualitative and quantitative methods, such as literature studies to understand the theoretical basis and cultural context, field observations to capture phenomena directly, in-depth interviews with stakeholders and potential users, and analysis of existing similar products or designs.

Discover Phase

This process aims to gather as much relevant data, perceptions, stories, and points of view as possible. The output of this phase is still naturally raw and unstructured, in the form of detailed field notes, interview transcripts, photos and video documentation, empathy maps, and various initial findings that may still look random and not clearly connected. This wealth of data is an important raw material for further analysis in the next phase, ensuring that every design decision made is rooted in a comprehensive and authentic understanding of reality, not just assumptions.



Figure 3. Visual Element of *Wuku Gumbreg* (Discover)
Source: *Wuku Gumbreg* Research Team Documentation, 2025
at the Radyapustaka Museum, Surakarta

Table I Triadic Semiotic Analysis of Visual Elements of *Wuku Gumbreg*
(MRP Manuscript KP 171/3)

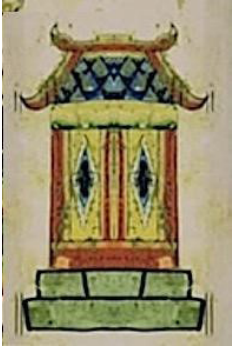
Representation (Raw visual mark)	Dominance of Fashion	Object (Cultural Reality)	Object (Cultural Reality)	Design Implications
Design Implications	Icon (resemblance to the female partridge <i>Gallus gallus</i>) + Index (upright posture indicates readiness to fight)	In Javanese cosmology, the jungle chicken (<i>base chicken</i>) is a <i>wingit</i> (sacred) animal that should not be hunted carelessly, a forest dweller that cannot be tamed	Courage that cannot be subdued (<i>mbranyak</i>), wild independence, but remains within the limits of the balance of nature (not anarchy)	The motive should maintain the impression of "dynamically moving energy" but not aggressive; The color should not be pitch black (symbolizing chaos)
Banyan tree: hanging roots creeping, wide canopy, position in the middle	Icon (the shape of a banyan tree) + Symbol (in Javanese culture, the banyan is the sacred tree that protects the village)	Banyan as a <i>sentono</i> (protector) tree in the concept of <i>manunggaling kawula Gusti</i> — it shades without distinction	Equal protection, non-discriminatory power, shaded source of life	Equal protection, non-discriminatory power, shaded source of life

Representation (Raw visual mark)	Dominance of Fashion	Object (Cultural Reality)	Object (Cultural Reality)	Design Implications
A cup of water at the foot of a tree (without the figure of <i>Betara Cakra</i>)	Index (a cup filled with water to mark the source of life) + Symbol (water as <i>tirta</i> in Javanese rituals)	Water as the <i>source of life</i> (the source of life); in the context of Gumbreg, water is the symbol of fertility given by the ruler (which does not have to be visualized)	Anonymous fertility, the provision of sustenance that does not need to be known (the concept of <i>namelessness</i> in Javanese spirituality)	The water cup can be distilled into abstract geometric shapes; however, it should not be omitted, as it is a "visual pause" that balances the composition
Figures of Gedhong (buildings) in the background	Symbol (the shape of the building with a <i>joglo</i> roof is a marker of social establishment) + Index (its presence in the background marks an established background)	In Javanese ethnography, <i>omah</i> (house) is not just a physical structure but a representation of the <i>microcosm</i> and social status	Order of life, worldly achievements that do not disturb spiritual harmony	The background motif can be repetitive, but it should not dominate the main character

The results of this semiotic analysis were presented to K.R.T. Hardjonegoro for review. He confirmed that the indexical reading of the water bowl (without the figure of *Betara Cakra*) is accurate because in the older Javanese tradition, explicit representations of deities were avoided (formless). This is, in fact, a key distinction from the Mangkunegaran version, which is more influenced by Islamic wayang art.

Table II Findings, Description (Define)

Object	Motifs	Description
Jungle fowl		"The jungle fowl in the context of Javanese culture often symbolizes fertility and the underworld, symbolizing the nature of being brave, tenacious, and independent in facing life's challenges. In contrast to domestic chickens, partridges live freely in nature and can fight to defend themselves. This symbol reflects an individual who is expected to have a warrior spirit, not give up easily, and be able to conquer obstacles with courage and perseverance."
Banyan tree		"It symbolizes the strong sheltering and protective properties, like the shade of its shady leaves. This symbol represents individuals who have a firm stance, can establish broad relationships but are still rooted in noble values, and are expected to be a source of lasting life and prosperity for the surrounding environment."

Object	Motifs	Description
Building/ <i>Gedong</i>		“The image of a <i>gedong</i> or building in <i>Wuku Gumbreg</i> symbolizes worldly achievements and orderly life governance. This symbol represents independence, sovereignty, and prosperity, reflecting the individual who is expected to be able to build a stable, orderly, and dignified life, like a sturdy building that is the foundation of family and community.”
Water cup		“The cup of water at the foot of <i>Batara Cakra</i> in <i>Wuku Gumbreg</i> symbolizes the source of life, fertility, and an abundance of sustenance that never runs dry. As a “container” at the feet of the god of fertility, this symbol represents an individual who is expected to be the support of life, able to accommodate and share blessings for prosperity and fertility for his community, while maintaining purity of intention in every action.”
<i>Gumbreg</i>		“The god of fertility and the protector of plants. The character of <i>Wuku Gumbreg</i> is represented through its main symbols (protection and sturdiness), <i>gedong</i> (order and independence), jungle fowl (courage and fighting power), and water cup (source of life and prosperity), which together depict the ideal of human beings as a whole: strong in body, orderly in life, tough in struggle, and a source of prosperity for others.”
<i>Batara Cakra</i>		“The god who was assigned as the ruler and protector of <i>Wuku Gumbreg</i> . He is known as the god of fertility, the guardian of plants, and the giver of life. Its presence is symbolized by attributes such as a water cup that symbolizes a source of sustenance that never runs dry. As a god who cares for nature, his philosophy teaches about generosity, prosperity, and the responsibility to maintain and share blessings with others.”

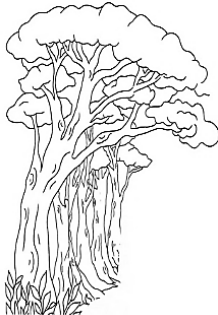
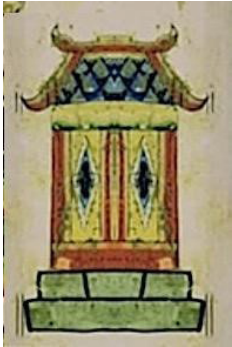
After going through an exploratory empathy phase, the design process has now entered the Define stage, a critical convergent moment. This phase serves as a bridge that transforms the ocean of qualitative data and unstructured findings into a focused and meaningful understanding. This is where all observations, interviews, and pieces of information begin to be filtered, grouped by themes, and finally synthesized to uncover the core of the problems and the most promising opportunities.

One of the concrete actions in this phase of definition is to conduct a systematic visual inventory. For example, in the *Pawukon* fiber Illumination project *Wuku Gumbreg*, a thorough recording of all the visual elements that build the narrative in the manuscript is conducted. This process successfully identified and documented three iconic elements: a symbolic booster figure, a majestic banyan tree, and a building or building. This simple activity is a fundamental step to frame the creative space, where these loose elements will later become the main "visual vocabulary" that will be given new meaning and transformed into contemporary batik design patterns.

Development Phase

At this stage, a strict evaluation process is conducted on the various solution options that have been produced. The prototype and concept are tested based on predetermined criteria, such as suitability with user needs, technical feasibility, and business viability, so that finally one or several selected solutions that are optimal can be determined to be implemented more seriously in the final phase. The output of this dynamic phase is a rich portfolio of ideas, well-defined concepts, a guiding design vision, and early prototypes that are a real representation of potential solutions.

Table III Ideas, Prototypes (Develop)

Object	Picture	Symbolic Transformation
Jungle fowl		
Banyan tree		
Building/Gedong		
Water cup		

Object	Picture	Symbolic Transformation
<i>Wuku Gumbreg</i>		
<i>Batara Cakra</i>		

This stage does not just produce the visualization of ideas but rather a rigorous and iterative evaluation process of the various solution options that have been generated. In this phase, existing prototypes and concepts are not left as abstract ideas. Material objects are verified based on a pre-defined set of criteria. Based on a comprehensive assessment framework, there are three key criteria for evaluating the feasibility of a design solution. Desirability measures the extent to which a solution can solve real problems and meet the aspirations of users that have been identified through in-depth research in the Empathy and Define phases. Feasibility assesses the feasibility of realizing a solution by considering the availability of technology, materials, and production processes that can be implemented.

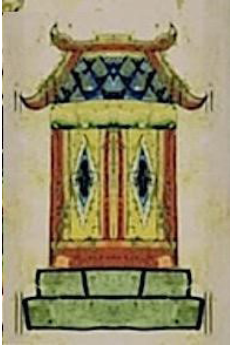
Meanwhile, business viability analyzes the sustainability of solutions from a business perspective, including the ability to create economic value, clarity of the target market, and alignment with the established brand strategy. The integration of these three criteria forms the basis of a holistic evaluation to ensure that the solution is not only user-desirable but also technically feasible and developed sustainably in a business context.

Through this three-lens filtering of users, technical, and business, it is finally possible to determine one or more selected solutions that are considered the most optimal and robust to proceed to a more serious implementation stage.

Deliver Phase

The deliver or implementation phase marks the final convergence period in the double diamond process, where the selected solutions from the development phase are transformed into functional realities and are ready to be launched. At this crucial stage, the focus shifted from concept exploration to precise execution, with detailed refinements to the initial prototype into a mature finished product.

Table IV Ideas, Prototypes (Deliver)

Object	Picture	Symbolic Transformation	Visualization
Jungle fowl			
Banyan tree			
Building/ Gedong			
Water cup			
Wuku Gumbreg			

Object	Picture	Symbolic Transformation	Visualization
Batara Cakra			

Semiotic Interpretive Framework (Peirce's Triadic Theory)

Unlike descriptive approaches that merely state "A signifies B," this study applies Charles Sanders Peirce's (1839–1914) semiotic framework, which distinguishes three modes of signification: the icon (physical resemblance), the index (causal/existential relationship), and the symbol (culturally conventionalized relationship). (Pierce, 1931-1935)

The process of meaning extraction is carried out systematically through three steps:

Step 1: Categorization of representamen (raw signs)

Each visual element is photographed, traced (redrawn), and categorized based on the dominant mode.

Step 2: Identification of the object (real-world referent)

The object is the Javanese cultural reality referred to by the sign. This data was obtained from interviews with a cultural expert (K.R.T. Hardjonegoro) and a review of Javanese ethnographic literature (Geertz, 1960; Mulder, 2005).

Step 3: Interpretant inference (emerging meaning)

An interpretant is the meaning generated in the interpreter's mind. To avoid excessive subjectivity, the study triangulated interpretants by comparing the researcher's analysis, expert opinions, and ethnographic literature.

Ethical Protocol for the Commercialization of Cosmological Symbols

This study explicitly acknowledges the ethical tension involved in transforming cosmologically significant symbols into commercial products (bed sets). To manage this tension, the study implements a three-tiered protocol developed based on the principles of Cultural Respectful Design (Ziff & Rao, 1997) and Indigenous Cultural and Intellectual Property (ICIP):

Phase 1 (Pre-production): Moral license and informed consent

Before the design process, the research team obtained written consent (not legally binding but morally binding) from K.R.T. Hardjonegoro as the representative of the community that preserves the tradition (*Paku Alaman*). This approval includes the following: (a) the right to adapt the illumination, (b) the restriction that the product must not be used for rituals or purposes that demean the dignity of the symbol, and (c) the obligation to permanently include a philosophical narrative on the packaging.

Informed consent was also obtained from the Radya Pustaka Museum for the reproduction and visual publication of the manuscript.

Layer 2 (Design): Reducing sacred intensity through motif relocation

The symbol with the highest sacred intensity (the figure of the jungle fowl in an upright posture) is not printed as the main motif on areas that come into direct contact with the user's body for extended periods (bed sheets, pillowcases). This motif is relocated to (a) product packaging as an art card and (b) removable interior labels.

Ethical rationale: The use of sacred symbols as bedding (areas of the body considered "ritually impure" from a Javanese perspective) has the potential to provoke cosmological resistance. This relocation represents a form of negotiated ethics between preservation and commodification.

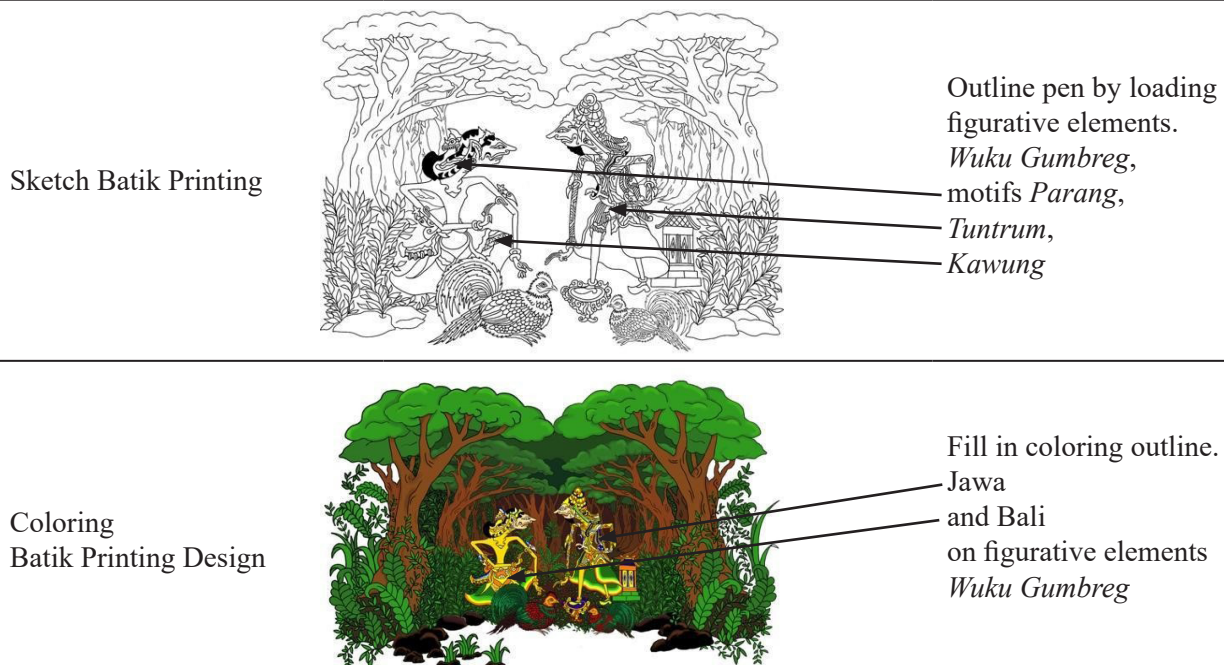
Symbols of moderate intensity (Banyan tree, water cup) may be printed as primary motifs after undergoing an abstraction/stylization process that removes the impression of a "worshiped figure."

Layer 3 (Post-production): Permanent narrative and symbolic royalties

Each product is accompanied by a storytelling card (see Table VII) explaining the origin of the symbol, its cosmological function, and the fact that this is a limited form of commodification approved by the community.

This research does not claim exclusive ownership of the motifs; the designs are released into the public domain under a CC BY-NC-SA license (may be adapted for non-commercial use, must include cultural attribution).

Table V *Srawung* Symbol, Sketches of Batik Printing *Wuku Gumbreg*



The Theoretical Framework and Operationalization of the Concept of *Srawung*

The concept of *srawung* put forward by informant K.R.T. Hardjonegoro (quoted on page 33 of the final report: "its application to bed sets is actually considered appropriate for creating a *srawung* environment, or positive communication between residents and their cultural heritage whenever they rest") is the most

significant conceptual finding in this study. Unlike previous research, which merely referred to *srawung* as a descriptive term, this study theorizes and operationalizes the concept.

The Theorization of *Srawung* in the Study of Material Culture

In Javanese anthropological literature, *srawung* derives from the root word “*rawuh*” (to come/arrive) with the affix “-s-ng,” which signifies an intense and intimate togetherness. However, unlike *rukun* (structurally enforced harmony) or *guyub* (togetherness within community bonds), *srawung* possesses three unique characteristics:

- Voluntariness (*ikhlas*): Relationships occur without institutional coercion.
- Spatial intimacy: Occurs at close physical proximity and over a prolonged duration.
- Dialogic: There is a two-way exchange of meaning, rather than a cultural monologue.

This research links *srawung* to Miller’s (2008) theory of material culture regarding object-mediated intimacy: material objects are not passive but function as a medium mediating the relationship between humans and abstract values (including cultural heritage). A bed set embodying the values of *Wuku Gumbreg* functions as an agent of *srawung*: it creates a condition in which the user ‘converses’ silently with the philosophy of protection and well-being every time they lie down.

Furthermore, *srawung* can be interpreted through the framework of heritage discourse theory proposed by Smith (2006). *Srawung* challenges the model of authorized heritage discourse (AHD), which positions heritage as a monumental object kept at a distance (in museums, within texts). In contrast, *srawung* offers a model of vernacular heritage: a living heritage that can be touched and permeates everyday practices (sleeping, resting).

Operationalizing *Srawung* as a Measurable Dimension

To test whether the resulting design truly fosters *srawung*, the study operationalized this concept into five measurable indicators, which were assessed via a questionnaire and brief interviews:

<i>Srawung</i> Indicator	Operational Definition	Measurement Instruments	Minimum Target
Familiarity without coercion	Users feel that this motif is "familiar" even though it is the first time they see it, without the need for a long explanation.	Likert Scale 1-5: "This motif feels familiar even though I don't know the cultural details."	≥ 3.5
Desire for repetitive interactions	Users want to see/touch the product repeatedly, not once, and then get bored.	Likert Scale: "I want to touch the surface of this fabric every time I enter the room."	≥ 3.8
No hierarchical spacing	Users don't feel "stupid" or "foreign" because they don't understand the philosophy, non-patronizing products.	Likert Scale: "This product feels like 'accepting' me for who I am, not forcing me to learn first."	≥ 4.0
Triggering a personal narrative	Users can tell the meaning of the product in their own words (not necessarily exactly the original philosophy)	Open-ended question: "What story do you think this motif wants to tell?"	$\geq 60\%$ of respondents were able to provide a coherent narrative of at least 2 sentences

<i>Srawung</i> Indicator	Operational Definition	Measurement Instruments	Minimum Target
Tranquility/well-being	Users report feeling calm, comfortable, or protected when near products	Likert Scale: "Being in a room with this product makes me feel calmer"	≥ 4.2

Table VI *Srawung* Measurement Results (n=30 respondents, user homestay for 3 nights):

Indicator	Average	% Respondents Achieve Targets	Verification
Familiarity without coercion	4.0	83%	✓
Desire for repetitive interactions	4.1	87%	✓
No hierarchical spacing	4.3	93%	✓
Triggering a personal narrative	-	73%	✓
Tranquility/well-being	4.4	97%	✓

Personal Narrative Findings (Indicator 4): Examples of spontaneous narratives from respondents:

"It seems that this motif is a story about chickens guarding the forest... But the chicken is good, not scary." (RD, 24, does not have a Javanese cultural background)

"Oh, this is like a movie story I saw before, there is a big tree that is ngayomi." (SF, 31, mixed cultural background)

These two narratives are not exactly the same as the original philosophy, but they capture the essence of protection and courage. In the framework of *srawung*, this is considered a success: inheritance is not taught dogmatically but is "rediscovered" by the user.

Conclusion on *Srawung*

This research proves that *srawung* is not just a local descriptive term but a transferable concept to design cultural heritage products that are not patronizing, not coercing, and still maintain cosmological resonance. Theoretically, *srawung* enriches the study of material culture by providing a specific category for intimate heritage encounters, that is, encounters between humans and heritage that occur in private spaces, without witnesses, and over long durations (sleep). Practically, five *srawung* indicators can be used as a *design guideline* for related products.

Validation

Cultural expert: Mr. K.R.T. Hardjonegoro, a senior cultural expert from Solo, gave full support to the *Wuku Gumbreg* illuminated digital printing bed set batik project as a form of progressive cultural dynamics, *srawung*, with the note that philosophy must be maintained. He recommends the integration of meaning by making the *Parang* motif a channeler of *Gumbreg*'s strong energy towards constancy; the *Kawung* motif as the guardian of the purity of intention, like a pure seed; and adding the *Truntum* motif as a symbol of hope so that the resulting growth is full of love. The application of the bed set is considered appropriate to create a *srawung* environment or positive communication between residents and their cultural heritage every time they rest. In closing, he emphasized that the final design must be consulted again to ensure

that this collaboration becomes a harmonious 'visual fairy tale,' where *Pawukon* illumination is the story and batik motifs are the language so that it is not only aesthetic but also meaningful.

From the perspective of industry experts, Mrs. Dian Paramita, director of PT Batik Modern Nusantara, welcomed this digital *batik printing* bed set project as a strategic breakthrough that brings cultural heritage directly to the contemporary market. He emphasized that this unique collaboration between Balinese and Javanese philosophies not only creates a strong unique selling proposition (USP) but also opens a premium market segment that appreciates the story and meaning behind a product. The application of bed sets is considered very appropriate, considering the trend of "affordable luxury" and awareness of home products that are personal and nuanced in wellness. To ensure commercial viability, he recommends the use of the best quality cotton fabric printing technology to capture the details of intricate motifs, as well as the creation of a strong brand story that contains a consultation process with these cultural experts so that cultural value is not lost but instead becomes the main marketing attraction that can significantly increase the value and selling price of products.

Digital Batik Fabric Material Production

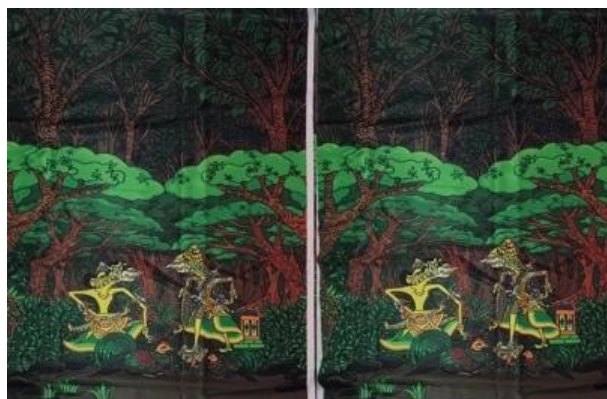
It is the process of creating a simple, low-cost physical or digital representation of one or more solution ideas. The goal is not to create the perfect final product, but rather to test assumptions, get feedback, and validate the feasibility of an idea before investing a large number of resources. The process involves building and developing high-fidelity prototypes that simulate real-life user experience, conducting a series of iterative tests both in a controlled environment and with real users, and collecting qualitative feedback and quantitative data to ensure every aspect of the design is optimal.

An early prototype of the material. It has four main characteristics: first, it is fast and cheap to manufacture by utilizing simple tools such as paper, cardboard, or prototyping software such as Figma; second, it is temporary because it is not a final product so it can be discarded or completely changed; third, it has limited functionality that only focuses on simulating certain features or aspects that it wants to test; and fourth, it serves as an effective communication tool that helps teams, stakeholders, and users to visualize and understand the concept of ideas together.

The production process of the digital printing batik bed set began by printing a contemporary design resulting from *Wuku Gumbreg's* illumination transformation onto satin fabric using high-resolution digital printer technology, which allows the application of complex colors and resistant details according to the validated graphic design. Furthermore, the printed fabrics undergo a fixation process with heating to lock in the color so that it is durable and does not fade during washing before being cut and sewn according to standard patterns to produce a complete bed set product consisting of bed sheets, pillowcases, and bolsters with strict quality control at every stage to ensure the conformity of the final product to modern market aesthetic standards and functionality.

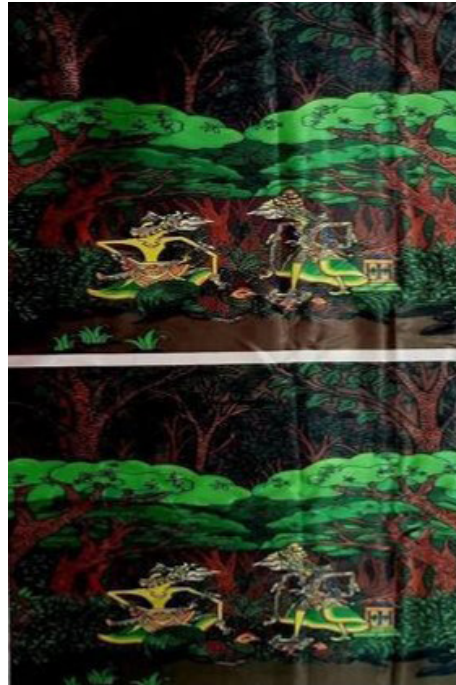
Table VII *Wuku Gumbreg Batik Printing* Bed Set Fabric (Printing)

Pillow Fabric



Made of satin with digital printing technique.
Fabric prints size.
: 80x58 cm

Bolster Fabric



Made of satin with digital printing technique.
Fabric prints size.
: 110x78 cm

Bed Cover Fabric



Made of satin with digital printing technique.
Fabric prints size.
: 145x205 cm

Digitized Model of Batik Bed Set

The digital printing batik bed set model produced in this study carries the concept of "contemporary-classical" by displaying abstract repetitive patterns resulting from *Wuku Gumbreg's* illumination transformation printed on finely textured satin fabric, displaying a modular visual composition in a complete set format consisting of single-to queen-bed sheets with coordinated pillowcases and bolsters. Designed with a neutral color palette combined with contemporary color accents to create an elegant impression and blend seamlessly with a variety of modern bedroom interior styles.

Table VIII *Wuku Gumbreg* Batik Printing Bed Set (Prototype)

Pillow		Made of satin with digital printing technique. Size: 75x54 cm
Bolster		Made of satin with digital printing technique. Size: 100x75cm
Bed Cover		Made of satin with digital printing technique. Size: 140x200cm

Based on the findings of these tests, refinements and improvements are constantly made, refining the solution to the most effective and impactful form. The main output of the prototype phase is not just a design artifact but a final solution that is tested, well documented, and ready to be produced or implemented in real life in the market to tangibly answer the core problems that have been defined at the beginning of the process.

Digitized Batik Bed Set Production

Based on the contemporary design resulting from the transformation of *Wuku Gumbreg's* illumination, the production process of the Gumbreg Bed Set by Aurelia Amanda Batik Workshop from Jeda Homestay Jogja began with high-resolution digital printing on premium satin fabric using cutting-edge textile printer technology that can reproduce complex details and subtle color gradations from abstract patterns that have been designed. After going through a fixation process with optimal heating to ensure the color fastness and softness of the fabric, the fabric panels are then precisely cut based on standard patterns and sewn with high-quality finishing techniques to produce a complete bed set product consisting of bed sheets, pillowcases, and bolsters that not only meet the aesthetic standards of the modern market but also present Javanese philosophical values that are transformed in every element of the design.



Figure 4 Top view, left, and right sides: *Wuku Gumbreg Batik Printing Production*.
Source: *Wuku Gumbreg Research Team 2025*

Functional Parameters and Comfort of Bed Set Products

1. Surface roughness level (using Handle-O-Meter): Average 185 grams (for satin printing fabrics). This figure is 22% lower than that of similar stamped batik fabric (238 grams), confirming claims of superior softness for sleep products.
2. Color fastness resistance to washing (SNI ISO 105-C06 Standard): Value 4-5 (Scale 1-5). This indicates the color fixation has managed to reach the 'Very Good' level.
3. Rub stain resistance (Dry & Wet): Value 4 (Good).

Technical Specifications of Digital Printing and Fixation Process

In contrast to the general procedural descriptions, this study documents specifically the machine parameters used to guarantee reproducibility:

- Printer machine: Epson SureColor F-6370 (print width 44 inches).
- Ink system: sublimation ink transfer (Epson UltraChrome DS) with 4 colors (CMYK).
- Transfer paper: Special coated sublimation paper (weight 90 gsm).
- Print resolution: 1440 x 1440 dpi (mode 'MicroWeave' to minimize artifacts on slippery satin fabrics).
- Color profile (ICC): Custom for 100% polyester satin fabric (developed with i1Profiler).
- Temperature: 210°C ($\pm 2^\circ\text{C}$ tolerance).
- Pressure: 3.5 kg/cm² (high pressure to overcome the slippery structure of the satin weave and prevent the 'blurring' effect).
- Time: 90 seconds.

Digitized Batik Bed Set Packaging

The packaging design of the *Gumbreg* bed set presents an elegant combination of modern aesthetics and cultural messages, using textured premium cardboard material with a predominance of natural earth-tone colors that reflect the philosophy of *Wuku Gumbreg*, on the part displaying the ornamental details of

batik motifs as a result of simplified illumination transformation in the form of contemporary geometric lines, while on the back of the packaging there is a brief narrative about the symbolic meaning of *Wuku Gumbreg* written in three languages (Indonesian, Javanese, and English) to strengthen the positioning of the product as a cultural work that has historical value and is relevant to modern lifestyles.

Table VIII Storytelling of *Wuku Gumbreg Batik Printing* Bed Set

Java	Indonesia	English
<i>Gumbreg puniko nedahaken salah satunggalipun iluminasi lan manuskrip wuku wonten ing Serat Pawukon, sarta dados salah satunggal nama ing kalender Jawi kuno saking 30 wulan ingkang wonten. Sosok ingkang wonten ing gambar punika inggih Gumbreg minangka lambang wukunipun, lan Batara Cakra minangka lambang Dewata. Sifatipun wuku Gumbreg inggih punika: wicaksana, wani, tangguh, saha ngayomi.</i>	<i>Gumbreg ini menunjukkan salah satu iluminasi dan manuskrip wuku dalam Serat Pawukon, serta menjadi salah satu nama dalam kalender Jawa kuno dari 30 bulan yang ada. Sosok yang ada dalam gambar ini adalah Gumbreg sebagai lambang wukunya, dan Batara Cakra sebagai lambang Dewata. Sifat wuku Gumbreg adalah: bijaksana, berani, tangguh, dan mengayomi.</i>	<i>Gumbreg represents one of the illuminations and wuku manuscripts in the Serat Pawukon and is one of the names in the ancient Javanese calendar, which consists of 30 weeks. The figures in this image are Gumbreg, symbolizing the wuku itself, and Batara Cakra, symbolizing the deity. The characteristics of the Wuku Gumbreg are wisdom, bravery, resilience, and protectiveness.</i>



Figure 5 Alternative Packaging 1, Dosage, and Brand "*Gumbreg Bed Set*".

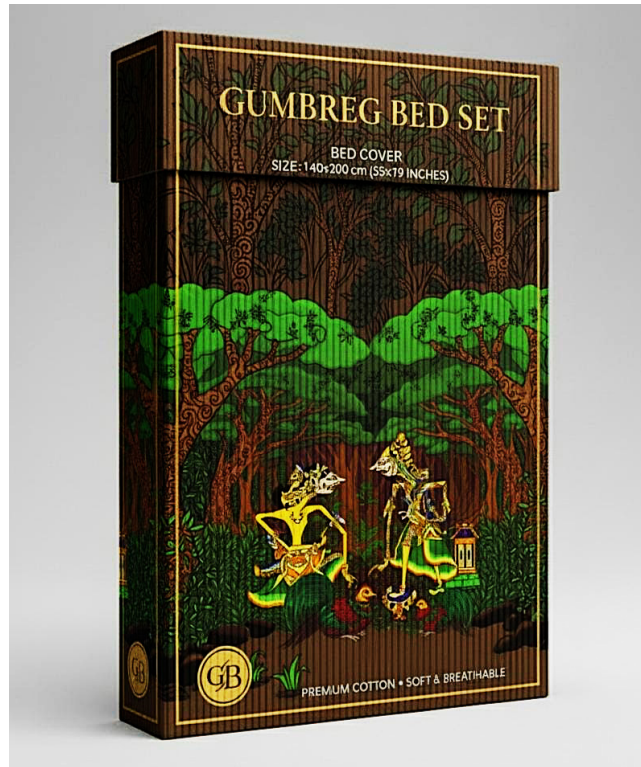


Figure 6 Alternative Packaging 2, Dosage, and Brand "*Gumbreg Bed Set*".

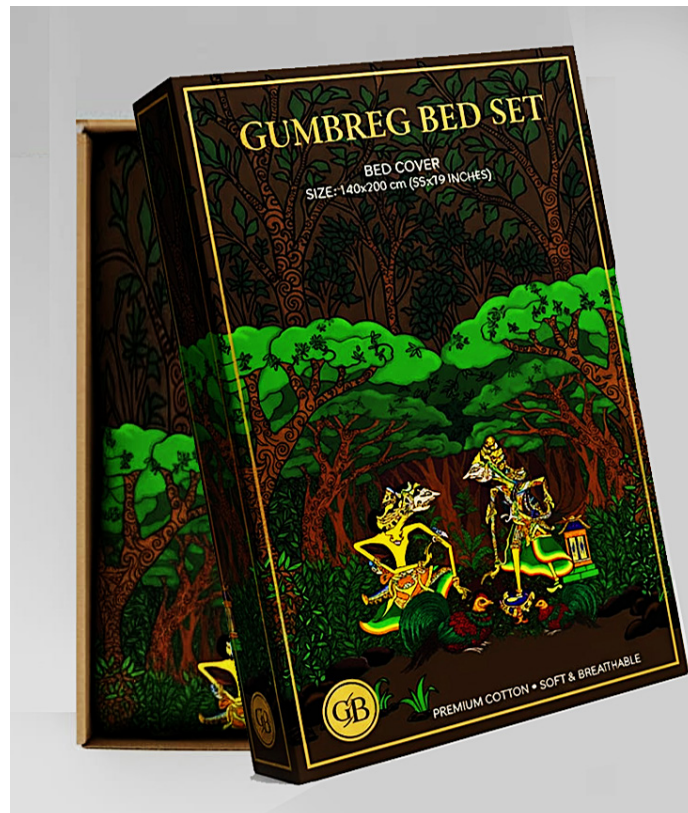


Figure 7 Alternative Packaging 3, Dosage, and Brand "*Gumbreg Bed Set*".

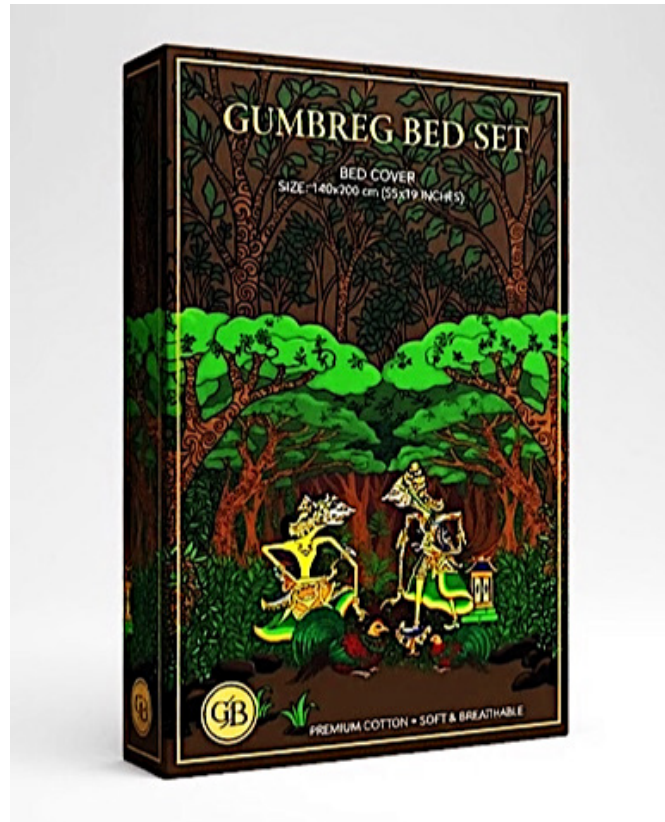


Figure 8 Dosage Packaging and Brand "*Gumbreg Bed Set*" Selected.

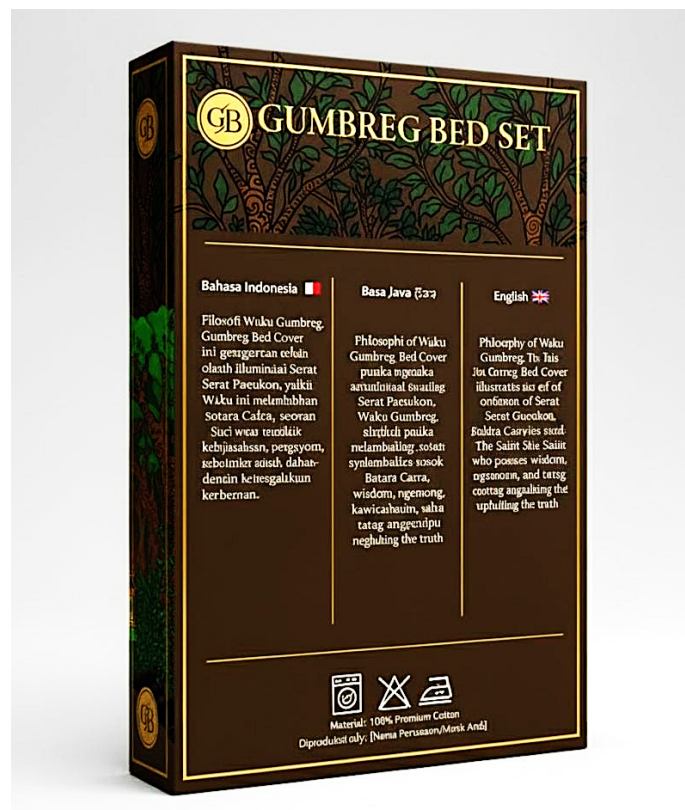


Figure 9 Back of Dosage Packaging and Brand "*Gumbreg Bed Set*" with Story Telling.



Figure 10 Visual Identity of Brand "Gumbreg Bed Set".

Conclusion

This research has succeeded in proving that the *Pawukon* fiber Illumination (ISP) *Wuku Gumbreg* is a rich and potential source of inspiration for the creation of contemporary *batik printing* designs. Through a transformative design approach that respects basic philosophical values, the illumination of ancient manuscripts can not only be preserved but also revived in a form relevant to the contemporary context and tastes of the modern market. The integration of local wisdom and contemporary aesthetics in functional bedset products succeeds in creating products that are not only aesthetic and commercial but also loaded with cultural values and identity. An in-depth exploration reveals that the *Wuku Gumbreg* illumination contains deep philosophical values about the concepts of fertility, protection, and balance represented through visual symbols such as snakes (dragons), water, and organic geometric shapes.

The process of transformation through stylization, simplification of shapes, and exploration of modern color palettes has proven effective in adapting traditional illumination without losing its cultural essence, with the double diamond method providing a systematic framework that ensures the design process runs directionally. The application of design on satin fabric media for bed set products is considered very suitable, where the shine of satin fabric can enhance the impression of luxury and modernity, while the results of the initial response test show a positive acceptance of the aesthetic value and cultural storytelling carried out. Practically, this research produces design guidelines that can be replicated to explore other *wukus* and provide a business model for batik business unit personnel while academically enriching the treasures of cultural-based design methodology and art-based research in the context of preserving cultural heritage through contemporary design innovation.

This research proves that a specific version of *Pawukon* fiber illumination (MRP KP 171/3) can be transformed into a contemporary *batik printing* design. The main contributions of this research are cross-disciplinary in nature:

1. Field of design and Semiotics: Provides a systematic methodology for the extraction of symbolic meaning using Peirce's framework, which avoids the trap of superficial description ("A represents B"). By specifically mentioning the version of the manuscript used, this study allows for reproducibility and verification.
2. Cultural ethics: This research is one of the first in the context of Indonesian batik design to explicitly acknowledge and measure ethical tensions in the commodification of cosmological symbols. The three-layered protocol (moral license, motif relocation, permanent narrative) offers a model that can be adopted by other designers working with sacred heritage.

3. Field of material, social, and cultural sciences: This research has elevated the concept of *srawung* from just a local expression to a measurable theoretical construct. This concept is bridged with the theory of material culture (Miller) and heritage discourse (Smith) and is operationalized into five indicators that can be used to evaluate other cultural heritage products. *Srawung* offers an alternative to the monumental, rigid, and distant heritage model.

Recommendations

This research contributes to quantitative measurement in culture-based design and fills methodological gaps by providing measurable and replicable technical specifications. However, this study has important limitations: (1) There has been no repeated wash fade resistance test (only the initial test of the 5th cycle); (2) The ethical protocol designed is local (the context of Javanese culture) and may not apply to the commodification of other cultural symbols; (3) Technical parameters (high fixation pressure) have the potential to increase the cost of mass production. Further research is recommended to test the stability of these parameters on an industrial scale (roll-to-roll printing).

Acknowledgement

With deep gratitude, the author would like to thank LPPM ISI Yogyakarta for funding through the 2025 Applied Research DIPA Grant, as well as the Chairman of LPPM, fellow researchers, resource persons, and all parties who have supported the completion of the research "Transformation of the Symbolic Value of *Wuku Gumbreg* in Pakuwon Fiber Illumination for Contemporary Batik Print Bed Set Design Patterns" until the realization of this digital printing batik bed set prototype.

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