

A Semiotic and Geometric Structure Synthesis of Traditional Kelantan Songket: A Critical Review on Digital Heritage Safeguarding

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DOI: <https://doi.org/10.47772/IJRISS.2026.102100187>

Received: 07 August 2026; Accepted: 13 August 2026; Published: 07 October 2026

ABSTRACT

Traditional Kelantan songket is more than just a handcrafted textile; it serves as a vibrant visual expression that embodies the socio-cultural values and semiotic identity of the Malay community. For centuries, skilled weavers have woven ecological insights, spiritual beliefs, and community standards of conduct into carefully designed textile patterns. However, modern academic discussions frequently fail to assess songket merely as a fixed material craft, thus neglecting the structural semiotic processes that shape meaning-making within the fabric. This critical analysis explores the convergence of textile design geometry and semiotic theory through a dual-layer model of signification comprising external physical denotation and internal connotative meaning, which are then applied to songket ornamentation, with a particular focus on deconstructing nearly extinct organic motifs such as the Ketam Guri. A comprehensive review of the literature shows that this heritage sector is facing a twofold crisis. On one side, a fear of the overlooked pattern arises from the inability to record the implicit knowledge of expert weavers in computational systems, which causes unnoticed cultural loss alongside the effects of a surge in inexpensive imported prints. Conversely, the escalation of global Generative AI technology has been noted to lead to significant semiotic breaches; as these algorithms do not possess the metadata required for genuine design principles, they generate visual anomalies that are fundamentally flawed. This review suggests a human-AI collaboration framework using a human-in-the-loop method to create a cohort of contemporary hybrid artisans capable of applying deep-rooted learning to secure traditional design principles digitally.

Keywords: Textile Semiotics, Ketam Guri Pattern, Implicit Knowledge, Semiotic Breach, The Hybrid Craftsman.

INTRODUCTION

The protection and preservation of material culture in Southeast Asia is currently undergoing a significant turn. Approaches to documenting and protecting heritage artifacts are increasingly focusing on intangible aspects such as intellectual, philosophical, and symbolic heritage, moving away from tangible preservation methods that emphasize only the physical upkeep of the pieces. Rapid globalization and digitalization force scholars to view these cultural artifacts not merely as static relics of the past, but as dynamic manoeuvres for the expression of identity.

In the history of Malaysian textiles, Kelantan songket emerges as a signifier of the high point of sophistication, refinement, and wisdom in traditional Malay handloom weaving. Its high aesthetic position is recognized across geopolitical borderlines of the Malay world. Technically, Kelantan songket is

characterized by the precise use of supplementary weft technique. By means of traditional manufacturing techniques, decorative metal threads, either of gold or silver, are interwoven and manipulated skilfully and systematically throughout the base fabric. The fabric background is in turn made from the cross-weaving of the ordered vertical warp threads and horizontal weft threads, which are made of high-quality cotton or silk thread.

Nevertheless, the main subject matter of this scholarly study should not be limited to just the surface beauty or aesthetic appeal of songket. The spiritual meaning and cultural identity in the visual language that exists in its materiality are what make the songket highly valuable. Every motif carefully woven on the grid axis of songket textile is deliberately made and chosen by the community of weavers in the past and is never a matter of coincidence or pure decorative purpose. From the perspective of structuralist theory, every form of organic or geometric motifs serves as a semiotic sign.

In terms of defining and demonstrating the sociocultural hierarchy within mediaeval society, it further highlights the fact that the traditional textiles of Malay culture were one of the key instruments through which visual communication appears. The motifs used for decorating these textiles represented a form of visual language used to communicate the codes, customs, hereditary class, royal rights, and sociopolitical order of traditional Malay society and were not merely decorative elements.

As per the detailed examination conducted by Arba'iyah (2021), songket is not just an expression of personal skill or expertise but is, rather, a significant indication of the entire process of cultural acceptance, assimilation, and absorption. The cultural metadata emerged through years of acculturation and assimilation of countless cultures within the Malay world. Such cross-cultural networking is reflected through records of the socio-cultural relations maintained between the royal establishment of the East Coast of the Malay Peninsula, specifically Kelantan and Terengganu, and sovereign entities of Sumatra, Indonesia, namely Riau and Siak. Such political marriages, migration of expert weavers, and trading of indulgence cloth items gave rise to a certain aesthetic style of songket which shares the same matrix of design identity and thus reflects strong cultural assimilation of Nusantara.

This form of intangible cultural heritage has unfortunately met a major crisis in present times. The local industry of songket weaving is currently encountering major complications due to the importation of cheap imitation products of the same from countries like India and Pakistan. The imitation products make use of the designs of songket that exist in the East Coast region through digital printing of the designs on cheap fabric. This has caused the economic system of the weavers of songket serious damage.

The third significant concern pertains to semiotic violations resulting from the use of commercial visual Generative AI algorithms like Midjourney (Sayuti et al., 2024). These models function mainly through pixel-diffusion methods trained on extensive Western aesthetic databases, which do not include domain-specific metadata related to traditional weaving patterns and cultural adab (Sayuti et al., 2024; Chen & Lou, 2025). As a result, when asked to create patterns inspired by songket, commercial AIs generate visual irregularities—like flowing organic shapes or asymmetrical linear arrangements—that breach the core physical principles of the conventional loom (e.g., fixed warp-and-weft intersections dictated by the kek and heras) (TiaNasha Sharieyna et al., 2018; Sayuti et al., 2024). This disconnection results in a significant semiotic gap by removing conventional motifs of their structural integrity and philosophical significance (Sayuti et al., 2024).

In other words, this crucial review has very relevant academic consequences. The reason is that it's not just a description of visual patterns, but it aims to trace an alternate path for the process of digitalization of real East Coast designs. The present study is important to ensure that a well-grounded and up-to-date digital security system will be created to safeguard the authentic nature of philosophical metadata, mathematical properties of grid designs, and semiotics of songket.

Setting a path for conducting a critical review paper requires clear guidelines on how to conduct a literature synthesis exercise without moving away from the context of problem solving. Hence, this critical review is

carried out in a targeted and thorough way to accomplish the two main research objectives which are Re-evaluation and Synthesis of the Denotation and Connotation in the Traditional Ornamentation and Digital Documentation Gaps Identification and Mapping for Rare Organic Motifs . The first aim of this research paper is to critically re-evaluate and synthesize the secondary literature available in regard to the relationship between the physical structure division (denotational aspects) and philosophical and sociocultural connotations in traditional textile ornamentation (Nani Hartina et al., 2021). This aim will allow the study to go beyond looking at songket as a physical object and static ornamentation. In addition to that, the review of the literature will be expanded to consider the relationship between the exterior geometric matrix and patterns of the kepala kain (head), badan kain (body) and kaki kain (foot/border) along with the traditional motif designs (TiaNasha Sharieyna et al., 2018) and their connection to systems of symbolic meaning creation, etiquette rules, expressions of Tawhid (monotheistic identity) and function of the garment as formal attire in Malay culture (Arba'iyah, 2021; Mohd Jamil et al., 2024). The dialectic synthesis of these two approaches (geometric/technical vs. cultural/philosophical) is essential for understanding the semiotics of civilization and semiotic markers in the textile surface design (Nani Hartina et al., 2021; Mohd Jamil et al., 2024). This objective also focuses on the identification, analysis, and mapping of digital documentation gaps related to the designs and continuity of the traditional motifs, in which the motifs are at risk of extinction because of the lack of the next generation able to preserve the knowledge about it (Muhamad Azwan et al., 2018) while paying special attention to the Ketam Guri motif. With this objective, the paper reviews how well existing literature has addressed the issue of documenting true craft techniques (Fatin Nur et. Al. 2019) in a digital and computational form. These academic gaps are evaluated through their connection to modern digital era issues such as craft resource management and adaptation of small businesses in response to modern visual innovations and automation (Abdul Samad et al., 2021). The successful accomplishment of this objective is important to build a solid theoretical base for further development of the digital-based cultural preservation framework for Malay textiles heritage.

LITERATURE REVIEW

Theoretical Framework: Structural Semiotics Roland Barthes

This paper uses the Structural Semiotic Theory proposed by Roland Barthes in 1967 to explore how meaning is created and how visual identity develops in traditional textile decoration. In modern craft research, heritage artifacts are often examined on their own, mainly shaped by technical talks about production or specific cultural-historical narratives. The semiotic viewpoint addresses these limits by offering a unified analytical framework that explores how ornamental patterns interact as a developing system of signs, according to Nani Hartina et al, (2021).

Barthes (1967) explained that no visual or cultural sign works only on one level. Instead, it operates through two organized orders of meaning: denotation and connotation. From this semiotic view, recognizing the signs in textile surface design is important in understanding the deeper meaning behind the processes of ideas and creation (Nani Hartina et al., 2021). In this semiotic context, heritage fabrics are seen not just as unchanging materials; they are visual texts that convey cultural messages in a dynamic way.

Structural Analysis of Grid Morphology and Technical Constraints (Denotation Stage)

At the primary level of meaning, Barthes (1967) defined denotation as the literal dimension that shows the external tangible aspect of a sign that can be immediately understood by the senses. Applying this denotative perspective to traditional textiles reveals that the visual structure of a motif is closely constrained by design principles and a strict layout of patterns. Studies suggest that the physical structure of the fabric is determined by a systematic spatial segmentation that includes conventional motif patterns and the organized layout of the fabric's head, body, and foot areas (TiaNasha Sharieyna et al., 2018)

These mechanical limitations arise from technical production factors, as songket is produced by intertwining cotton or silk yarns with silver or gold threads through specific methods (Fatin Nur et. al., 2019). In denotative terms, the loom's physical constraints hinder weavers from easily creating naturalistic, curved

forms. As a result, weavers are required to partake in a process of abstraction, converting organic natural forms into geometric, grid-based patterns dictated by precise mathematical ratios or the songket weaving method used on the silk foundation (Fatin Nur et. al. 2019).

Thus, a very complex kind of traditional mathematical reasoning is hidden beneath this process of visual representation. In order to ensure that the fabric's design is harmonious, traditional weavers manually calculate grid coordinates and symmetry ratios while arranging pattern repetitions. This inflexible denotative structure establishes the main physical identity of Kelantan songket.

Analysis of Symbolism, Historical Assimilation, and Cultural Philosophy (Connotation Level)

When semiotic analysis goes past surface appearances, it reaches the realm of connotation, which is the second order of signification. Barthes (1967) states that connotation is the area where the denotative signifier aligns with a community's sociocultural values, beliefs, and ideologies. Arba'iyah's (2021) thorough study demonstrates that songket essentially stands as a representation of shared acknowledgment and integration of cultural values. It is abundant in various meanings and symbols in which both overt and subtle, originating from the natural surroundings.

In the Malay-Islamic perspective, natural shapes are abstracted to embody values of politeness, humility, and Tauhid (the oneness of God). For example, the patterned motifs present on traditional fabrics such as Songket Tenggarung hold substantial connotative significance, acting as esteemed formal wear for Malay royal events while also reflecting aesthetic identity and societal standing (Mohd Jamil et al., 2024).

Additionally, secondary data reveals that the visual design of songket reflects a history of intercultural connections and active regional integration. Due to strong socio-cultural connections and diplomatic relations between the royal entities of the Malay Peninsula's East Coast, particularly Terengganu and Kelantan, and areas in Sumatra, Indonesia (including Riau and the Siak Sultanate), the exchange of weaving knowledge took place widely (Arba'iyah, 2021).

Historical accounts concerning the involvement of royal institutions in promoting this heritage art form, along with the relocation of master weavers (like Wan Siti Wan Karim, who moved from Terengganu to Siak in the 18th century), confirm that the local visual language of songket exhibits a uniform and similar design identity matrix (Arba'iyah, 2021). These expressive visual arrangements clearly illustrate that the intelligence, attitude, and imagination of the traditional Malay community have consistently been closely linked with the principles of budi (inherent virtue), morality, and elegant cultural decorum.

Secondary Literature Synthesis Matrix

To consolidate academic perspectives and objectively identify gaps in the existing literature, this secondary review has been mapped onto an expanded synthesis matrix (Table 4.1). This matrix critically compares the methodology, key findings, limitations, and theoretical contributions extracted from the reference documents:

Table 4.1 Secondary Literature Review Synthesis Matrix

Scholar Source	Methodology	Key Findings	Limitations	Contribution to Proposed Research Gap
Arba'iyah (2021); Mohd Jamil et al. (2024)	Qualitative historical document analysis & museum artifact examination	Emphasized the integration of regional cultures (East Coast-Riau) and the significance of songket design (e.g., Tenggarung) as visual	Intensely centered on sociocultural connotation without considering computational encoding or geometric weaving	Defines the necessary connotative cultural metadata for the proposed SeniAI-Weave framework to avoid cultural misrepresentation.

		indicators of social status and ceremonial conduct.	factors.	
Nani Hartina et al. (2021); Barthes (1967)	Semiotic framework analysis & theoretical review	Framed heritage textile surfaces are dynamic visual texts functioning within two levels of meaning (denotation and connotation).	Stayed mostly on a theoretical plane; did not connect semiotics with algorithmic guidelines or Generative AI limitations.	Offers the basic Structural Semiotic framework to connect physical motifs with cultural significances.
TiaNasha Sharieyna et al. (2018); Fatin Nur et al. (2019)	Qualitative case study & oral history/fieldwork with traditional weavers	Recorded spatial division (kepaIa, badan, kaki kain) and the mathematical representation of organic shapes into grid coordinates on the weaving frame.	Concentrated solely on traditional weaving methods without converting grid coordinates into digital or computational forms.	Provides the denotative geometric matrix and technical loom specifications required for digital pattern retention.
Nanthakwang & Sangnak (2026); Muhamad Azwan et al. (2018)	Qualitative review & empirical craft documentation	Recognized the significant danger of "Fear of the Forgotten Pattern" because unrecorded tacit knowledge persists in digital systems.	Tackled implicit knowledge loss broadly, yet did not offer a cohesive AI-enhanced human-in-the-loop approach for textiles.	Emphasizes the critical need for digital documentation of rare motifs such as Ketam Guri.
Sayuti et al. (2024); Chen & Lou (2025)	Visual analysis & deep learning implementation review	Showed that commercial Generative AI produces semiotic gaps and complex designs because of insufficient domain-specific metadata.	Assessed commercial AI shortcomings but failed to provide a culturally aware framework customized for Malay songket design.	Supports the necessity for a culturally informed, human-centered framework (proposed SeniAI-Weave / Hybrid Artisan).

As outlined in Table 4.1, the current literature is still divided between technical denotational research (TiaNasha Sharieyna et al., 2018; Fatin Nur et al., 2019) and sociocultural connotative investigations (Arba'iyah, 2021; Mohd Jamil et al., 2024). Additionally, although recent research emphasizes the semiotic violations of commercial Generative AI (Sayuti et al., 2024), it does not present a cohesive model that incorporates both mathematical grid parameters and cultural metadata into a computational framework. This essential comparison directly supports the need for the suggested SeniAI-Weave conceptual framework to address these theoretical and methodological gaps.

Qualitative Research Framework and Document Examination

This analytical review investigates the theoretical framework and semiotic systems of traditional textiles using only a qualitative approach. In contrast to conventional empirical studies that rely heavily on primary data collection in fieldwork or laboratory settings, the research strategy of this critical review is exclusively

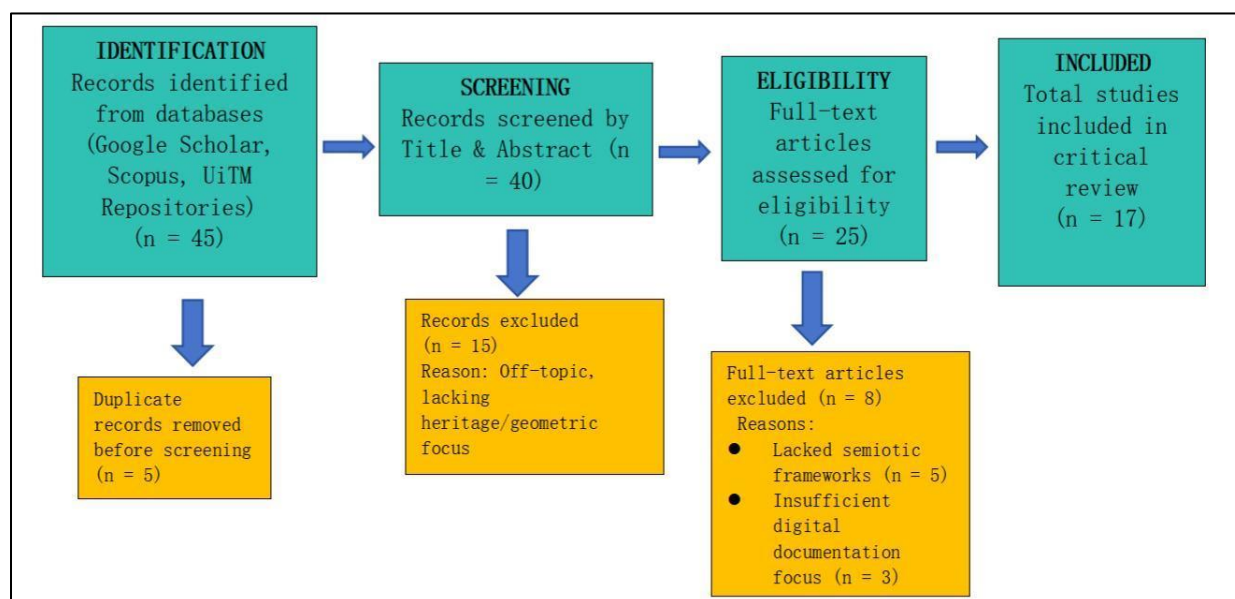
focused on the methodical examination of secondary data from documents. Choosing a qualitative design that focuses on text and document analysis is consistent with the methodological perspectives of Creswell and Creswell (2018), who claim that document analysis is a crucial instrument for evaluating, understanding, and integrating literary works to identify patterns and unanswered research questions.

This qualitative text analysis approach was purposefully chosen as it allows the researcher to analyze, contrast, and perform a thorough assessment (interpretive assessment) of the current literature without changing or modifying the original data framework. Using this approach, the movement of visual imagery on the fabric surface can be explored beyond the object's physical limits.

Strategy for Data Gathering and Selection Criteria

Operationally, the qualitative research process was systematically controlled through a sequence of document searches and screening stages utilizing precise, focused keywords. The search was conducted online through key peer-reviewed academic databases (including Google Scholar, Scopus, and local institutional repositories) utilizing keyword combinations (Boolean operators) like "Kelantan songket," "motif semiotics," "grid morphology," and "Malay textiles."

Figure 1: PRISMA 2020 Flow Diagram of the Literature Selection Process



To ensure the relevance and satisfaction of the literature and the assessment criteria of prestigious journals, the selection of references was intentionally restricted through purposive sampling to peer-reviewed articles, monographs, and conference proceedings released in a recent period (Abdul Samad et al., 2021). Documents that did not specifically address the geometric structure or symbolic significance of the textiles were objectively omitted to maintain the review's concentration.

As shown in Figure 1, 45 records were first identified from Google Scholar, Scopus, and UiTM institutional repositories. Following the elimination of 5 duplicate entries, 40 articles were subjected to title and abstract evaluation, leading to the rejection of 15 unrelated studies. The 25 full-text articles left were assessed based on stringent inclusion criteria emphasizing textile semiotics, grid morphology, and gaps in digital preservation. In the end, 17 essential sources were chosen for synthesized thematic coding and qualitative document analysis.

Thematic Analysis of Data (Thematic Coding)

Following that, the documents that satisfied the strict screening standards were gathered and analyzed thoroughly. By employing the thematic coding method described by Braun and Clarke (2012), the secondary data were subsequently examined thematically, adhering to a thematic analysis framework. The coding

process aimed to deconstruct, arrange, and classify the secondary data from the reference materials into smaller, structured conceptual units.

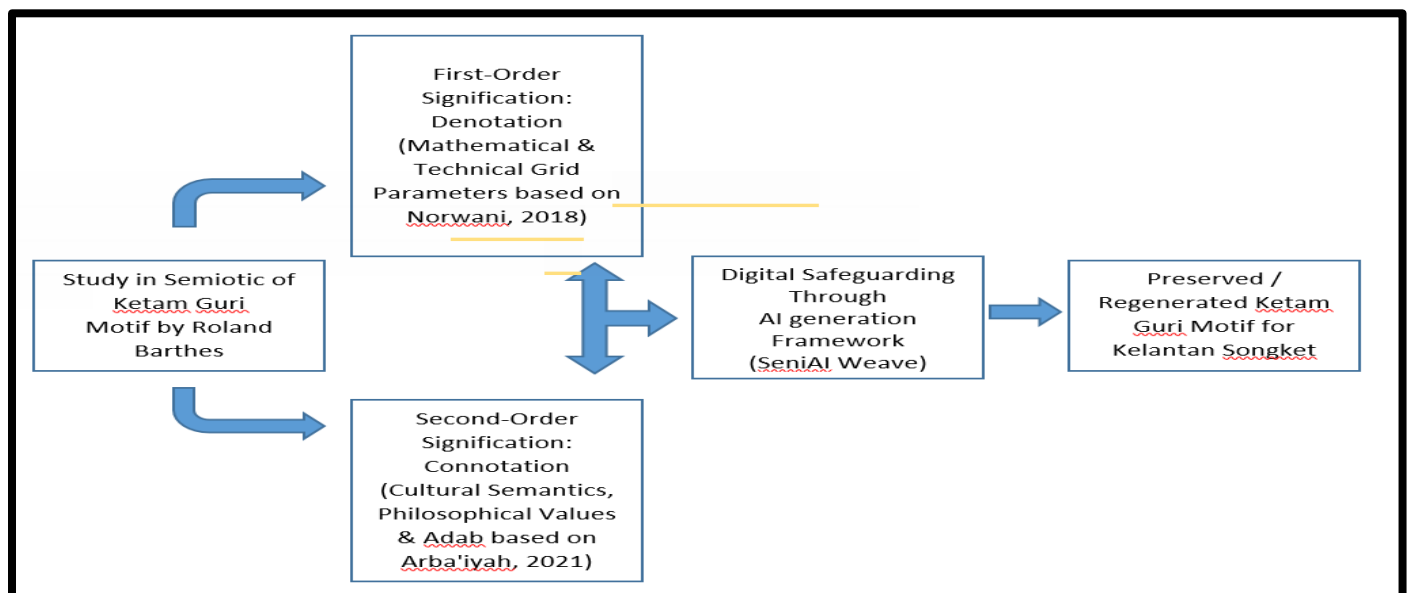
During this coding process, the data were effectively divided structurally into two complementary primary themes, specifically:

1. **Denotation Component (Tangible Framework of Decoration):** Emphasis is placed on data encoding related to technical production elements, the physical limitations of the woven textile, the principles of warp and weft configuration, conventional motif patterns, and the reasoning behind geometric grid structures (TiaNasha Sharieyna et al., 2018); Fatin Nur et. al. 2019).
2. **Connotation Element (Cultural Thought):** Emphasis is on embedding subtle meaning units, the philosophy of local historical integration, guidelines for dress, the significance of the monarchy, and the utilization of sign analysis via a semiotic perspective (Arba'iyah, 2021; Nani Hartina et al., 2021; Mohd Jamil et al., 2024).

This structured methodological operational framework is essential for guaranteeing that all results and key discussions in this paper maintain significant academic reliability and validity, thus facilitating a thorough reassessment of the path for the digital preservation of East Coast craft heritage.

Using the organized thematic analytical approach, a proposed conceptual framework was synthesized. As shown in Figure 2, the structural semiotic method outlines the connection between the technical grid limitations (First-Order Signification) and cultural metadata (Second-Order Signification) to assist in developing the recommended proposed SeniAI-Weave framework aimed at preserving and revitalizing traditional motifs:

Figure 2: The proposed conceptual design framework of SeniAI-Weave



DISCUSSION

Semiotic Case Examination: Analyzing the Unique Organic "Ketam Guri" Pattern

A thorough examination of current literature uncovers a significant documentation issue concerning traditional organic designs classified as rare or nearly extinct, particularly highlighting the Ketam Guri motif (which comes from the wild plant *Sida rhombifolia*). Utilizing Roland Barthes' two-level framework of signification, the structural conflict between the motif's tangible components and its conceptual richness can be precisely outlined.

According to TiaNasha Sharieyna et al., (2018), the Ketam Guri motif's geometry establishes a design framework based on an intricate eight-pointed star pattern at the literal visual level on the cloth surface. From a technical weaving standpoint, forming this eight-pointed star shape demands precise compliance with design guidelines rooted in intricate, centrally aligned axial reflection symmetry on the loom. Every grid coordinate requires accurate computation of the warp and additional weft threads to guarantee the motif's symmetrical shape remains aligned with the fabric's foundational grid (Fatin Nur et. al. 2019).

Connotatively, when delving into the depths of Malay-Islamic cultural importance and perspective, the use of a weed or wild plant like Ketam Guri has profound sociocultural implications. It denotes resilience (the plant's ability to thrive and spread in any soil), humility (a simple, ordinary plant turned by skillful craftspeople into exquisite gold-thread embroidery), and cosmic coherence. This philosophy exhibits a structural connection to the use of conventional organic design motifs in various heritage aspects, like the Awan Larat motif in traditional woodwork (Sabri et al., 2021). In the context of Malay craft aesthetics, floral shapes are regularly transformed beyond their realistic forms to represent the qualities of submission, obedience, and devotion of created beings to the (Sabri et al., 2021).

Analysis of Three Key Intellectual Discrepancies

Despite the semiotic depth present in these heritage designs, a cross-examination of documents discovers three significant dialectical gaps that threaten the sustainability of the textile heritage craft sector:

Diminution of Implicit Knowledge (and Cultural Obliteration)

The primary issue in the conventional textile sector is the "Fear of the Forgotten Pattern" crisis, arising from a gap in knowledge across generations (Nanthakwang & Sangnak, 2026). The creation of mathematical grids, weaving ratio computations, and the complexities of the intricate geometric arrangements of designs such as the Ketam Guri have never been officially recorded in digital archives or contemporary computational systems. Rather, these advanced abilities are retained exclusively as passive or implicit knowledge and retained as mental recollections orally transmitted by a declining group of elderly master weavers (Nanthakwang & Sangnak, 2026; Muhamad Azwan et al., 2018).

With each generation unwilling to inherit this genuine craft, the flow of modernity threatens the visual language and symbolic identity of these unique patterns, placing them at risk of total disappearance and quiet cultural disappearance (Nanthakwang & Sangnak, 2026; Muhamad Azwan et al., 2018).

Effects of Economic and Market Forces (Economic Fragility of Traditional Craftspeople)

The uniqueness and market viability of local songket are declining because of the pitch of economical, mass-produced imitation textiles (Nani Hartina et al., 2015). The creation of genuine hand-woven songket is a task that demands weeks of effort and incurs significant labor expenses, which unfairly compete with factory-produced, digitally printed textiles from India and Pakistan that only replicate the look of songket (Nani Hartina et al., 2015).

These market forces directly undermine the economic stimuli for traditional artisans, demanding a reassessment of human resource management approaches and small-business frameworks to adapt to the present digital value chain environment (Abdul Samad et al., 2021).

Artistic Alteration and Semiotic Breach by Western Generative AI

The latest and third issue is the cultural bias crisis caused by the improper use of global commercial Generative AI algorithms like Midjourney. When modern designers try to employ AI systems for creating songket-influenced cultural product designs, global AI models often make significant semiotic errors (Sayuti et al., 2024). This happens because Western AI algorithms are developed using public internet image datasets that do not contain metadata about design principles and the deep cultural significance related to indigenous textiles (Sayuti et al., 2024).

As a result, the AI produces arbitrary, warped, and imperfect designs that detach visual components from their initial contextual significance and technically break the physical principles of the loom (including smoothly curving lines that cannot be woven with the mechanical limitations of a conventional loom). Failure to address this deficiency in structural authenticity may compromise the visual integrity of Malay textile heritage (Sayuti et al., 2024).

Towards a Framework for Innovation: Collaboration Between Humans and AI

To address the identified gaps, this important discussion claims that the craft community ought not to completely lie off artificial intelligence technology but rather work towards the idea of the "Hybrid Artisan" (Pop-Cohut, 2026). By appropriate integration, deep learning co-creation frameworks can be utilized to educate AI models to grip both the semantic richness (connotative significance) and the visual complexities (grid-oriented denotative framework) of conventional crafts (Chen & Lou, 2025).

Upcoming digital advancements need to forgo complete automation that relocates people; rather, they should move towards "human-in-the-loop automation" that enhances the creative independence of traditional craftspeople (Nanthakwang & Sangnak, 2026; Pop-Cohut, 2026). Integrating mathematical grid parameters (like the Punca Potong fabric design principles from Prof. Norwani's (2018) data) with chains of cultural-meaning metadata (Arba'iyah, 2021) into a culturally sensitive smart application (such as SeniAI-Weave) enables the sustainable preservation of the intelligent heritage power of Malay textiles amidst global technological disruptions.

CONCLUSION

Summary of Theory and Validation of Hypothesis

This critical review definitively shows that both scholarly hypotheses and propositions presented at the start of the research are upheld. The synthesis of documents indicates that the preservation of traditional East Coast songket, especially in Kelantan, will inevitably fail if researchers and policymakers ignore the strong dialectical relationship between the denotative element (the technical features of grid morphology) and the connotative element (philosophical dimensions and sociocultural significance).

Songket cannot be viewed simplistically as just a fixed, ornamental material commodity or an unchanging artifact of history. Rather, this "queen of fabrics" functions as a visual means of communication and a dynamic sign system that continually supports traditional order, manners, and native identity that reflect the cultural philosophy of "shared ancestry, shared cultural sophistication" that records the narrative of assimilation throughout the Nusantara area (Arba'iyah, 2021; Mohd Jamil et al., 2024).

Sociocultural Consequences and the Ongoing Digital Emergency

This analysis claims that the lack of official records on the geometric characteristics and implicit knowledge of expert craftsmen (Muhamad Azwan et al., 2018) has placed heritage textiles at a twofold risk. On one side, the sector encounters economic vulnerability from a wave of inexpensive, counterfeit printed textiles brought in from India and Pakistan, which destabilizes the network of micro-artisans (Nani Hartina et al., 2015). Conversely, the emergence of automation and the Western algorithm age (like Midjourney) have led to cultural distortion and significant semiotic infringements, as these systems do not hold the metadata that includes genuine design principles (Sayuti et al., 2024). This matter requires a thoughtful reassessment of ways to protect the visual integrity of traditional crafts from the upsetting hazards introduced by commercial technology (Abdul Samad et al., 2021).

Suggested Future Path (SeniAI-Weave and the Hybrid Artisan Idea)

This research suggests a theoretical and practical shift in approach towards creating Culturally Sensitive Computational Frameworks via digital system innovation, exemplified by the suggested SeniAI-Weave

smart mobile app. Utilizing deep learning methods, AI technology can be reprogrammed with culturally aware, limited datasets to capture complex visual aspects of the grid and the semantic richness of uncommon organic patterns, like the Ketam Guri (Chen & Lou, 2025).

This upcoming innovation does not seek complete automation that removes human contribution; instead, it strongly encourages the development of the "Hybrid Artisan" idea through collaboration between humans and AI, utilizing human-in-the-loop automation systems (Nanthakwang & Sangnak, 2026; Pop-Cohut, 2026). This hybrid semiotic method is critical for digitally encoding conventional design principles. It not only acts to tackle challenges from outside reproductions and worldwide algorithmic biases but also guarantees that the essence, moral principles, and structural integrity of Malay textile heritage are sustainably maintained for future generations.

ACKNOWLEDGEMENTS

The authors wish to convey their deepest appreciation to the organizers and editorial committee of APB-LEAPS for allowing them to participate in this significant discussion on preserving digital heritage. Sincere gratitude and deep appreciation are offered to the groundbreaking researchers in Malay textile heritage, especially Dr. Arba'iyah Ab. Aziz, Prof. Madya Dr. Norwani Mohd Nawawi, and their associated research collaborators, whose fundamental writings, design guidelines, and cultural records enabled the integration and creation of the conceptual framework in this research. The writers express gratitude to all the scholarly researchers, skilled weavers, and cultural professionals whose ongoing commitment to maintaining the traditional Kelantan songket sector is the motivating factor for this digital preservation project.

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