Volume 2, Issue 4

Innovation Series Quarterly

https://journal.academicapress.org/aps/index.php/isq

Research Article

Modular Heritage: Modernizing Selangor's Bunga Tanjung Kelopak 9 into Contemporary Jewellery Utilizing BDPQ and Tetris Spatial Concepts

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Keywords:
BDPQ Method
Modular Design
Modern Jewellery
Bunga Tanjung Motif
Visual Identity

Abstract: *The Selangor's 'Bunga Tanjung Pecah Sembilan' motif is going out of fashion in modern fashion. This practice-based research transforms the traditional motif into contemporary jewellery to preserve this regional identity. The combination of BDPQ spatial ideation (geometric abstractions through typographic inversion) with Tetris-inspired modular interlocking is novel. The motif was 3D prototyped as a 916-gold neckpiece with red RBC gemstones by CAD deconstruction. Quantitative surveys show that young people strongly accept this minimalist wearable art and prefer it over traditional fabrics. The practice helps keep Selangor's cultural identity alive and relevant for the younger generations.*

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1. INTRODUCTION

The importance of visual language in Malay craftsmanship visual language within traditional craftsmanship is an important mechanism for documenting, communicating and preserving cultural identity. Indigenous art, crafts and textiles have always been unique markers of geography, history and sociology for their respective communities. Within the framework of Malay culture, the philosophical idea of 'Rupa dan Jiwa' (Jamal, 2007) is of great importance in artistic expression in nature and the environment. This notion implies that the physical expression of a design is closely related to the cultural ethos, spirituality and philosophy underneath. Some flora and fauna motifs are rarely used for aesthetic decorative purposes alone but express core values, philosophical wisdom, and regional pride (Ismail & Ahmad, 2020). These motifs are an elaborate visual vocabulary, transferring the identity of a community from one generation to another in the absence of written records. Batik with the 'Bunga Tanjung Pecah Sembilan' motif in the state of Selangor, Malaysia, is a prime example of this local visual language. The 'Bunga Tanjung' (Mimusops elengi), was recently gazetted as the official state heritage motif (Selangor State Assembly, 2023). This flower is very fragrant and has been associated with traditional royal palaces, local folklore and celebratory ceremonies for a long time. The nine-petaled variant is used as a symbol of state pride in textiles, batik block prints and wooden architectural

carvings. The Bunga Tanjung Kelopak 9, like the Getam Guri motif which is deeply embedded in the cultural identity and history of Kelantan, functions as a visual ambassador for Selangor, communicating the region's identity and ensuring cultural continuity through the centuries (Zainal & Othman, 2019).

Despite its extensive history and substantial semiotic value, the literal adoption of state-specific heritage motifs like the 'Bunga Tanjung Kelopak 9' in traditional textiles faces the challenge of retaining relevance in the modern era. Rapid globalisation and the influx of fast fashion toward minimalism, modularity and global trends (Ghazali & Awang, 2012) have changed the aesthetic preferences of the demographics of the younger generation to a great extent. The modernisation of consumer lifestyles has been a contributing factor to this. A crisis of relevance is happening to the traditional visual vocabulary in the everyday use. Research shows that the younger generation sees traditional Malay textiles, intricate batik patterns and embellished classic motifs as old-fashioned, impractical or only for formal occasions (Ghazali & Awang, 2012). Traditional motifs which do not adapt to evolving visual tastes and daily functional needs are marginalised. Ismail and Ahmad (2020) caution that without an active design intervention, this local visual vocabulary may disappear completely from public spaces. Heritage motifs that are only contained within traditional forms risk becoming passive historical artefacts in museums rather than dynamic and evolving elements of modern cultural identity. Therefore, there is a critical and urgent need to actively translate this local visual language into modern mediums, such as contemporary jewellery rather than merely copying or reproducing it on traditional two-dimensional canvases.

To address the widening gap between the preservation of traditional heritage and contemporary user aesthetics, this practice-based design research is guided by the following specific objectives. The first is to visually deconstruct the language of structure and radial symmetry that exists in the traditional motif of the 'Bunga Tanjung Pecah Sembilan' of Selangor. Second, to mathematically convert traditional organic motifs into abstract geometric forms using the systematic BDPQ space ideation framework. Next is to apply the idea of space from Tetris, using modularity, geometric arrangement and interlocking configuration to create contemporary wearable jewellery designs. Through quantitative market validation, to measure the extent to which structured design methodologies can modernise traditional local visual languages and appeal to younger demographics, without losing the cultural essence of the regional motifs.

The research is an important contribution to the field of cultural preservation, material culture and product design. It provides a replicable framework (BDPQ integration and Tetris modularity) for designers who wish to rejuvenate other dying cultural motifs throughout Malaysia and Southeast Asia, by demonstrating that ancient heritage motifs can be successfully abstracted and modernised into wearable art that is scalable. In addition, the study stimulates economic potential within the creative industry and jewellery sector by taking advantage of the growing market for products that are supported by storytelling and cultural resonance, thereby offering a commercial blueprint for heritage in a contemporary context for local artisans (Hassan & Kassim, 2017).

2. LITERATURE REVIEW

To understand the significance of 'Bunga Tanjung Kelopak 9' during modernisation, the theory of material culture is applied. Prown (1982) observes that objects produced by society are a profound reflection of the beliefs, values and fundamental assumptions of that society. Material culture of the traditional Malay society, especially the textiles and wood carvings, relies heavily on semiotics, the

study of signs and symbols. Jamal (2007) emphasises that Malay motifs are not just decorative but are imbued with Islamic philosophical principles of infinity, humility (as evidenced by tendrils that never point upwards) and balance. 'Bunga Tanjung Kelopak 9' serves as a semiotic signifier for Selangor. But the paradigm shift between generations calls into question the preservation of this semiotic identity. According to Ghazali and Awang (2012), the younger generation has a reduction in interest to traditional Malay textile in daily contexts. When the aesthetic form of a product no longer fits with the user's self-image, the emotional link to the product is broken. In his emotional design theory, Norman (2004) states that for an object to be accepted by the users it must fulfil the three levels of cognitive processing which are: visceral (immediate visual appeal), behavioural (functionality and usability) and reflective (personal satisfaction and identity). Traditional heavy textiles often fail to connect with modern youth on the visceral and behavioural levels, necessitating design interventions that embrace modern minimalism while retaining reflective cultural identity.

Designers need to employ geometric abstraction to bridge the visual gap between highly ornate traditional aesthetics and contemporary minimalism. Abstraction keeps the essential or basic 'soul' of a design, leaving out the old decorative details. This research is based on the 'BDPQ' space ideation method to achieve this abstraction systematically, not arbitrarily. The 'BDPQ' method is derived from the typographic anatomy and spatial relationship of the lowercase letters 'b', 'd', 'p', and 'q' (Coles, 2013). All four characters have the same basic geometric structure (consisting of a round bowl and a vertical stem). Its spatial orientation in a two-dimensional plane, for example by horizontal and vertical reflections, completely characterises it. Jalaludin et al. (2023) show how the use of this typographic logic in product design ideation can turn organic subjects into sharp contemporary geometric structures. Designers can take the core vector shapes and systematically flip them horizontally and vertically to create a new, balanced, and highly modern matrix of geometric shapes that can be mathematically traced back to the original subject, ensuring that the cultural DNA is not lost in translation.

The geometric shape is generated through the BDPQ process; it needs to be assembled into a functioning product. The research draws on modularity theory, which proposes that complex systems, products or structures can be efficiently built by connecting smaller, independent and interchangeable units (Baldwin & Clark, 2000). Modularity is highly appreciated in today's industrial design and fashion due to its scalability, manufacturing productivity and structural diversity. This study proposes a spatial concept inspired by Tetris to regulate the interaction of these modular units. Tetris, the classic 1980s puzzle video game, is essentially based on the cognitive principles of mental rotation, geometric arrangement, and interlocking connection of modular shapes called 'Tetrominoes' (De Lisi & Wolford, 2002). Designers can work with the abstract shapes produced by BDPQ as individual 'Tetris blocks' and play with how the positive and negative space can slot together. This interlocking concept is very important in jewellery design as it allows the rigid geometric blocks to be assembled to form a continuous and visually cohesive pattern. This gives structural integrity and aesthetic rhythm and turns disparate geometric shapes into a coherent chain that can be worn.

The choice of materials is key to the translation of heritage into the contemporary market. 916 gold, which is 22-karat gold and contains 91.6% pure gold mixed with metals like copper and zinc to make it durable, has strong cultural, economic, and ceremonial ties to Southeast Asia (Hassan & Kassim, 2017). It's the normal things for wedding dowries, investments and heirloom legacies. But 916 gold is traditionally used for very intricate designs in Malay jewellery, with lots of filigree or 'Kerawang' and traditional profiles (like brooches or hair pins), which are often seen as old-fashioned by the young crowd. The research deliberately and powerfully compares 916 gold to minimalist designs drawing inspiration from Tetris and BDPQ geometry. It makes the 916 gold more attractive, connecting a very traditional material with the elegant taste of today's consumers.

3. METHODOLOGY

This research employs a holistic Practice Based Research (PBR) methodology. The physical manipulation of materials and the resulting objects are important for the discovery and validation of new knowledge in PBR the creation process. This design process is organised into a systematic chronological framework of five stages deconstruction, ideation, structural engineering (CAD), prototyping, and market assessment.

The design process starts by analysing the traditional 'Bunga Tanjung Pecah Sembilan' Batik motif visually and structurally. This stage aims to peel away the normal organic and fluid aesthetic of canting batik or block printing to expose the mathematical core and structure of the motif. The researcher isolated a flower display. The motif's radial symmetry was plotted using a digital imaging tool. The exact rate of the nine petals emanating from the center bud is calculated, which is the defining characteristic of this Selangor motif. A systematic visual reduction process reduces the natural curvature of the traditional petals to a simple outer vector framework line. This highly precise symmetrical geometric unit becomes the 'seed' or core unit for the next phase of ideation, ensuring that all future abstractions remain anchored in the mathematics of its original motif.

Mimicking the typographic evolution of the letters 'b', 'd', 'p', and 'q', the unit of the 'Bunga Tanjung' was first reflected across the vertical Y-axis (creating the corresponding 'd' shape for 'b'). It is then reflected across the horizontal X-axis (creating the corresponding 'p' and 'q' shapes). Breaking Symmetry: This spatial manipulation deliberately breaks the traditional and safe flower petal symmetry. The overlapping of these inverted units creates new abstract intersections, sharp internal angles, and modern geometric structures. The researchers picked the resulting matrix, opting for variations that have the best balance of modern minimalism but still subtly reflect the anatomy of the original 'Bunga Tanjung Pecah 9'.

Then, the concept of the Tetris space is used to build the macro chain structure after generating various filtered BDPQ geometric blocks. The chosen BDPQ units are treated as modular puzzle pieces (like tetrominoes). The cognitive principle of mental rotation (De Lisi & Wolford, 2002) is used to move these units over a digital canvas to determine the exact points of interlocking. Much of the researchers' attention was focused on the relationship between positive forms and negative spaces. The aim is to make the positive geometric projection of a BDPQ unit exactly match the negative curved space of the neighbouring unit. This interlock mechanism results in a structurally robust continuous network, replacing the fragile traditional chain links with strong modular architectural-style connections.

Once the 2D interlocking pattern is finalised, the vector design is extruded to a complete 3D digital environment to build a physical prototype. This stage is very much about the mechanical feasibility, ergonomics and material qualities of the design as a wearable object. For material mapping and gemstone placement, the 3D model is rendered with the correct visual and physical properties of 916 gold, correctly calculating the density of the metal and the refraction of light. Meanwhile, the digital prong settings of the geometric Tetris blocks are adjusted at certain points of intersection to securely accommodate the Round Brilliant Cut (RBC) gemstones.

To attain superior ergonomics and articulation, the design must be mechanically crafted for adaptability, guaranteeing that the substantial, inflexible geometric forms operate seamlessly as a comfortable and wearable necklace. This prototype sets the precedent for the use of traditional jump rings at interlocking knots hidden beneath the Tetris blocks. These loops work as mechanical hinges. The hinge allows the modular blocks to articulate, rotate and naturally conform to the ergonomic contours of the human collarbone and neck rather than being a rigid collar. Finally, a standard lobster clasp is incorporated into the design to ensure practical wear, ease of use and safety for the user.

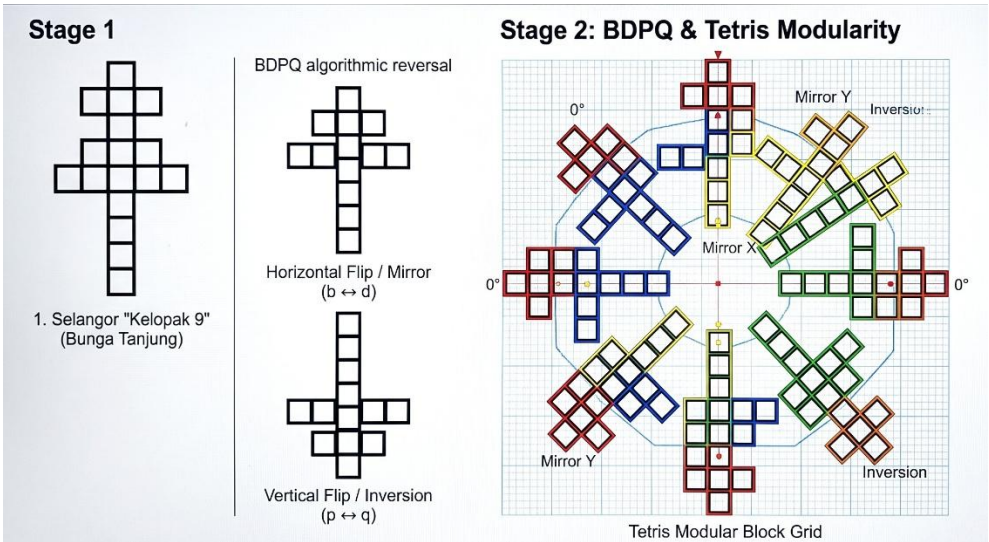


Figure 1. Application of the BDPQ design methodology and Tetris modularity in CorelDraw, demonstrating the step-by-step algorithmic reversal of the Stage 1 'Kelopak 9' vector units to generate a new matrix of visual possibilities.

To verify the success of the translation of the designs from traditional textiles to contemporary jewellery, an empirical quantitative survey was designed and distributed. The aim is to see if the updated design connects with the target audience and if it still communicates its cultural message effectively. The researchers employed purposive sampling to gather data using a structured 'Google Forms' survey, successfully obtaining 150 usable responses from the target population of youth and young adults (aged 18–35) in Selangor, Malaysia. The survey instrument employed a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree) to assess three major components, visceral aesthetics, practical usability and cultural retention.

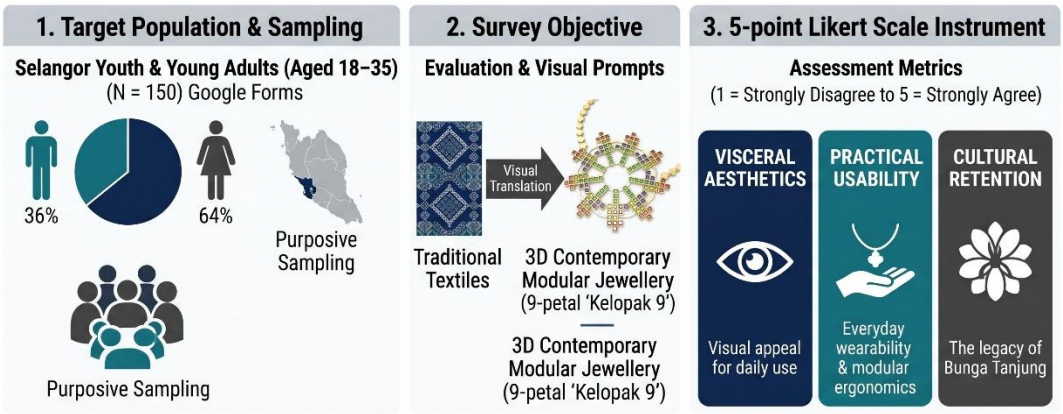


Figure 2. Overview of the survey methodology (N = 150) evaluating the successful translation of the Selangor 'Kelopak 9' BDPQ/Tetris design from traditional textiles into modern wearable jewellery.

Respondents were presented with high-resolution visual assets that compared the traditional Batik Bunga Tanjung textiles side-by-side with a fully rendered 3D video prototype of the new 'BDPQ Tetris' jewellery collection.



Figure 3. Fully rendered 3D video prototype of the new BDPQ/Tetris jewellery collection.

4. FINDINGS

Practice-based methodology and quantitative data collection subsequently yield meaningful findings that can be acted upon regarding the viability of structural engineering design and its psychological acceptance by the modern consumer market.

The main physical finding of this research is the successful translation of two-dimensional organic textile motifs into structurally solid and wearable three-dimensional objects. The BDPQ methodology along with Tetris modularity effectively filters the 'Bunga Tanjung Kelopak 9' into a presentation that totally wipes away its former connotations. The visual analysis of the 3D video display shows the modular blocks fitting together with precision, creating a strong rhythmic visual repetition typical of worthwhile contemporary architectural style jewellery. The deliberate juxtaposition of crisp, burnished 916 gold geometries with the bright color refractions of the RBC gemstones produces a contemporary aesthetic that differentiates the work and is radically distinct from traditional Malay filigree works. The CAD mechanical engineering prototype has also been successful.

This design is highly scalable as heritage motifs are treated as modular geometric units connected by hidden jump rings. The inflexible 'Tetris' blocks forbid any movement, but the loop hinge system allows the required articulation for the chain to be resting ergonomically. This confirms that geometric abstraction is not only conceptual art but also a product that is ready for modern CAD/CAM (Computer Aided Design and Manufacture) production processes such as 3D wax printing and lost-wax gold casting.

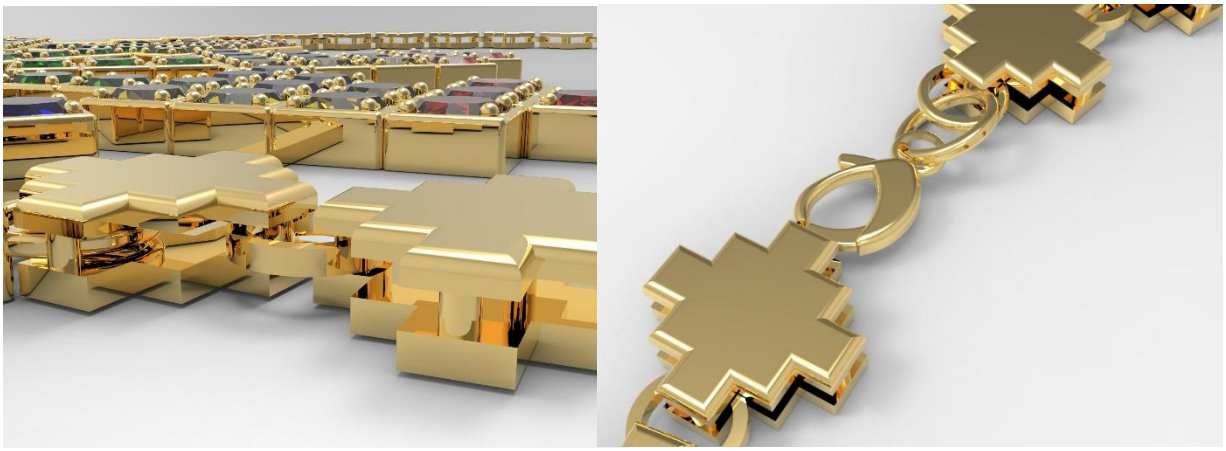


Figure 4. Detailed 3D rendering of the jewellery prototype showcasing mechanical design elements, including hidden jump rings and a robust lobster clasp for secure modular connectivity.

The market acceptance survey received responses from 150 people. The demographic breakdown confirms that this survey has successfully accessed a significant target audience for analysing modern trends in consumer behaviour. Of the respondents, 64% (n=96) identified as women and 36% (n=54) identified as men. The age distribution is skewed very heavily toward youth and young professionals: 42% are between 18 and 24, 38% are between 25 and 30, and 20% are between 31 and 35. The cultural heritage of Malaysia was known to all the respondents, making them an ideal sample to assess the modernisation of local motifs.

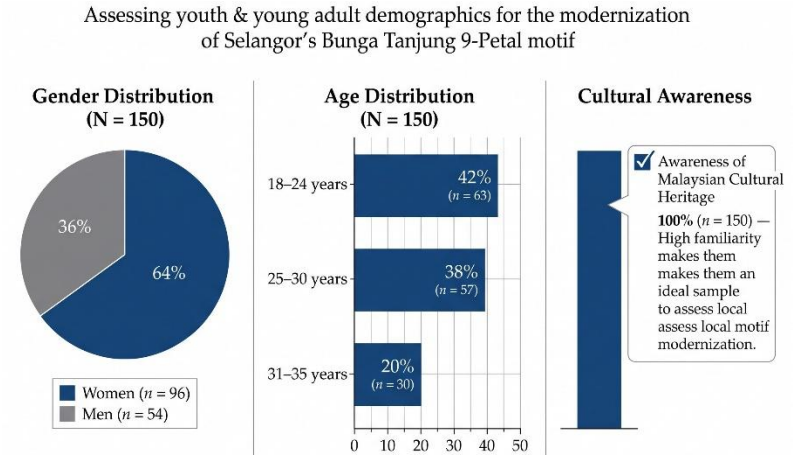


Figure 5. Demographic Profile of Survey Respondents (N = 150)

Looking at visceral aesthetics (Norman, 2004) was very positive for the modernised prototype. 87.3% of the respondents rated the aesthetically pleasing of the 3D 'BDPQ Tetris' jewellery prototype for daily use as 4 or 5 on the Likert scale. In the open-ended part of the survey, qualitative responses frequently used words such as minimalist, clean, edgy and sophisticated as the main reasons for positive ratings.

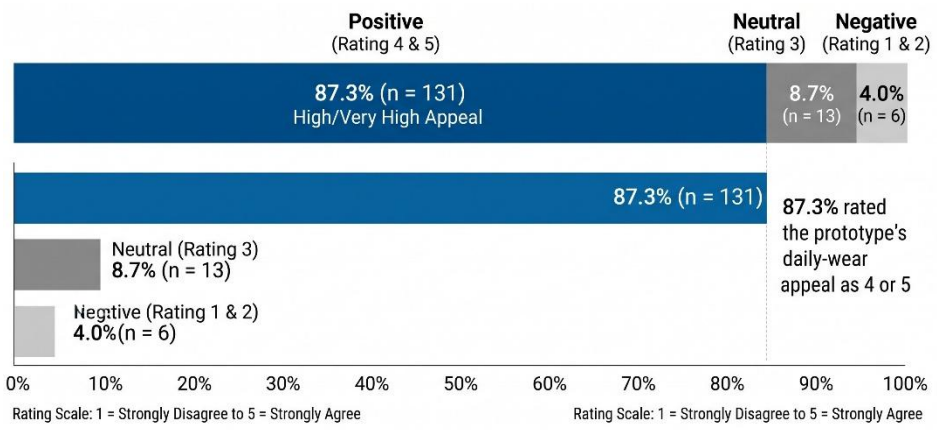


Figure 6. Visceral Aesthetics: Visual Appeal for Daily Wear (N=150).
Respondent ratings for the modernized 3D BDPQ/Tetris jewellery prototype based on a 1-5 Likert scale

This data clearly shows that abstracting traditional organic motifs into sharp geometries successfully aligns these heritage items with current globalisation fashion trends.

One critical metric for this research is the comparison of wearability. Respondents were shown a comparative analysis comparison of traditional 'Batik Bunga Tanjung' clothing and modern jewellery displays. The survey assessed which representation of the motif 'Bunga Tanjung' respondents would be more likely to incorporate into their daily wear. A significant percentage of 79.4% of respondents chose the modern 'BDPQ Tetris' jewellery over traditional textiles. These findings directly support the assertion by Ghazali and Awang (2012) that modern youth seek applications of heritage that are modernised, refined, and functional rather than a literal implementation of traditional practices. The modular jewellery format allows users to express their identity without the stylistic commitment of wearing the entire traditional outfit, thereby enhancing the daily utility of the motif.

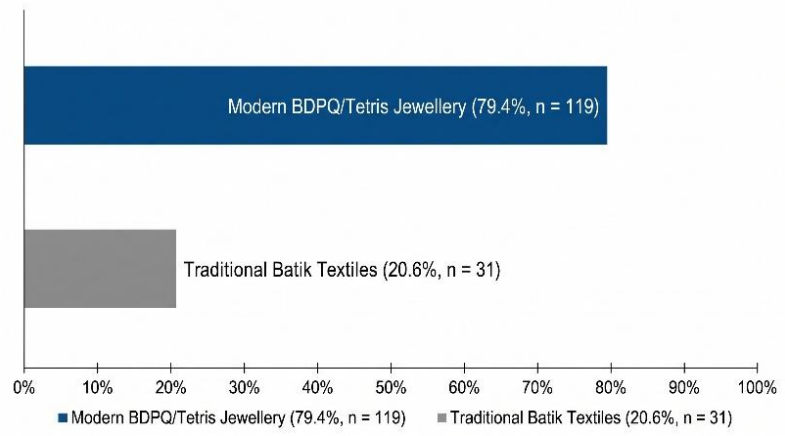


Figure 7. Preferences for Daily Wear: Modern Jewellery vs. Traditional Textiles Evaluating which format of the Tanjung Flower motif respondents would be more likely to incorporate into daily wear (N = 150)

The most profound finding relates to the retention of semiotic meaning following extreme geometric abstraction. A common criticism of heritage modernisation is the fear that abstraction will erase the 'Jiwa' of a cultural object (Jamal, 2007). But the survey data contradicts this concern. When told of the design's origin and its mathematical connection to the 'Bunga Tanjung Kelopak 9', 83.5% of respondents agreed (scoring 4 or 5) that wearing the contemporary piece would make them feel actively connected to Selangor's heritage. The respondents appreciated the 'secret' or highly embedded nature of the motif, saying it seemed to be a personal tribute to their regional identity, rather than an overly prominent traditional garment. This shows that extreme geometrical abstraction with BDPQ framework does not cut the emotional and cultural resonance of regional motifs, if its mathematical core is preserved.

5. DISCUSSION

The empirical findings and the successful implementation of the physical prototype in this study bring about several important discussions for the future direction of cultural heritage management, design innovation, and the commercial viability in the creative industry of Malaysia.

The main novelty and theoretical contribution of this project is the drastic shift it brings in the approach to cultural preservation. Preservation of fading heritage motifs in the past was largely dependent on passive archiving methods. Institutions worry about preserving historical textiles, putting elaborate wooden carvings behind glass museum cases or restricting the use of traditional motifs to infrequent cultural events. These methods do succeed in protecting physical artefacts from degradation, but they effectively remove the visual language from the daily lives of the community. This study actively promotes cultural preservation. By combining a specific regional motif (Bunga Tanjung Kelopak 9) with a systematic modern design framework (BDPQ and Tetris modularity), the motif does not become irrelevant. This motif in contemporary jewellery is reinterpreted in a new, dynamic and tactile manner for the modern generation to wear, interact with and express their Selangor identity. This heritage is no longer a static relic that must be respected from a distance but a living conversation, a piece of daily fashion that naturally fits into the user everyday lives.

The success of this final prototype confirms the use of a semi-mathematical structured framework in creative design, especially when dealing with sensitive cultural artefacts. The attempt to modernise cultural motifs indiscriminately often leads to accusations of cultural appropriation or destruction of the original meaning. The BDPQ method is a protective mechanism. It guarantees that the update of the motif is systematic and can be logically tracked. This modern design preserves the precise mathematical DNA of the Tanjung Flower because the geometric abstraction is derived solely from the inversion and reflection of the proportions of its nine original petals. Moreover, the application of Tetris spatial concepts solves the main structural problem of modern jewellery design, organically combining modularity and high-end aesthetics. The interlocking of the Tetris blocks results in a visual perception of the chain as a continuous architectural pattern, rather than a series of disconnected small ornaments.

From an economic and industrial perspective, the study shows significant commercial viability for local craftsmanship and the jewellery manufacturing sector. The integrity of this structure elevates the design from a simple handcrafted project to a high-end contemporary piece of luxury jewellery that can compete on the global stage (Jalaludin et al., 2023). The luxury and contemporary fashion market is increasingly driven by consumers seeking 'story-driven' products, for example items that offer a minimalist aesthetic of global brands but also include deep, personal, or local cultural narratives (Hassan & Kassim, 2017). By treating heritage motifs as interlocking modular units, this design is highly compatible with modern CAD/CAM processes. These 'Tetris' modular units can be mass produced

efficiently by 3D wax printing and standard gold casting. This reduces the labour costs of custom made to order, reduces human error in the complex interlocking joint connections and maintains very high-quality control. This scalability provides economic potential for the local creative industry, providing a lucrative business model and showing that Malaysian regional identity can be commercially viable and profitable.

While highly successful in its objectives, this research acknowledges certain limitations. The physical prototype was entirely designed in a CAD digital environment and tested on high resolution 3D video displays. The software has mathematically calculated the mechanical engineering of the connector loop and the weight calculations, but the physical 916 gold mould has not been produced yet for real-world stress testing. Secondly, the market acceptance survey had a limitation of 150 people in the sample, mostly living in urban areas. Expanding the sample to include rural demographics or older generations could potentially result in different perspectives of the acceptability of the state's official motif abstraction process.

6. CONCLUSION

In conclusion, the present study has adeptly addressed the pressing issue of the diminishing importance of the traditional Malay visual language in the backdrop of the rapid modernising fashion aesthetic. Through a systematic deconstruction of the official Selangor motif 'Bunga Tanjung Kelopak 9' and the innovative application of the BDPQ spatial ideation process and Tetris modular concept, this traditional organic flower has been successfully transformed into a contemporary, scalable and structurally sustainable jewellery collection. The last prototype, made from 916 gold and RBC gemstones, successfully bridges the young demographic's desire for minimalist geometric aesthetics and the active preservation and communication of Selangor's regional cultural identity.

Quantitative survey data provide unequivocal proof that through abstraction of structured geometry in modernising historical heritage, wearability of the everyday life and user appeal increase drastically, without erasing its cultural essence. This project proves that preserving heritage does not mean replicating history or locking it up in the museum archives. The innovative design methodology can be applied for the blending of historical heritage and modern spatial engineering concepts to produce a living identity delivery tool.

Future research should focus on the creation of the physical prototype, proceeding from the 3D CAD visualisation to the physical gold casting by using the lost-wax technique. This will serve as a basis for real-world ergonomic testing, analysis of heavy load distribution on the collarbone, and assessment of the articulation of the connecting loop as it relates to human movement. In addition, the BDPQ and Tetris integration framework developed in this study can be systematically applied to the heritage motifs of other regional areas in Malaysia such as Getam Guri from Kelantan, the Pua Kumbu pattern from Sarawak or the Black Pepper motif from Johor. With the expansion of this methodology, it can create a holistic national framework for the active preservation of indigenous cultural heritage through contemporary wearable art platforms, ensuring that the diversity and uniqueness of visual language styles in Malaysia are preserved, relevant and a source of pride for future generations.

Acknowledgments: I would like to thank the people that helped to make this research possible. Special thanks to jewellery design students who participated as respondents, providing important insight on the wearability of the modernised Bunga Tanjung motif. I am grateful to my fellow academicians for their helpful suggestions in the theoretical and methodological phases. Finally, I would like to thank the industry professionals whose practical knowledge confirmed the structural and aesthetic viability of the BDPQ/Tetris jewellery prototypes. This study was carried out independently, but your collective perspectives were integral to its successful completion.

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