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A STUDY ON SONGKET MOTIFS, FAMILIARITY, PREFERENCES, AND THE POTENTIAL APPLICATION OF GENERATIVE AI TO CREATE INNOVATIVE CULTURAL PRODUCT DESIGNS.

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ABSTRACT

Designers should consider deep-rooted connotations and values when designing contemporary and innovative cultural products. The dominance of science-technology-related approaches should not deprive us of the opportunity to preserve our cultural and traditional values. This paper, from an industrial design perspective, proposes the use of selected songket motifs in everyday product designs to preserve the national heritage. This paper aims to explore alternative applications of songket motifs and develop fresh approaches to improve their utilisation. Moreover, this paper provides enhanced deliberation on the familiarity of selective traditional songket motifs, preferences on motifs, and their potential application to everyday innovative design. 215 Malaysians from various backgrounds participated in an online survey to validate the prospective uses of traditional songket motifs. The survey utilised 16 common traditional songket motifs that were restructured using Adobe Illustrator (Ai) CS5 and AI was used to propose and envisions the products embedded with songket motifs as idea development proposals. As a results, 59.4% of potential consumers agree that daily-use products should incorporate songket motifs, because of their global cultural aptitude. Furthermore, the adaptation of visual representations or the translation of motifs into Malay, given their various names, may influence the recognition of motifs in the findings.

1. INTRODUCTION

Songket is one of the most ancient and opulent textiles in the Malays' repertoire. When intricate weaving techniques were combined with motifs that were completely bioinspired by nature and the surrounding environment, it demonstrated exquisite taste in fabric design. Songket motifs are frequently used to demonstrate the Malay societies' traditional ways of life. Historically, the motifs symbolised Malay dominance over power, as the royals traditionally wore them (Azizi, 2002; Nawawi, 2002). Songket is also known as Malaysia's 'queen of textile art' (Halimaton et al., 2009).

The songket's recent listing on UNESCO's Intangible Cultural Heritage of Humanity list has boosted the local textile sector. This timely acknowledgement is expected to help bring other attractive Malaysian artistic traditions to the global scene (Teh, 2022). The Yayasan Tuanku Nur Zahirah foundation has chosen to direct its efforts on songket. Songket weaving is a realistic profession. It helps improve working conditions at home, as weavers who opted to stay home were single mothers, providing them with a stream of money while preserving and promoting Malaysian culture and tradition. It is also supported by Kheng and Ngo (2010) and Zhang et al. (2019), who say that the skills needed to weave traditional songkets are becoming more and more endangered because of the fast growth of factory-based weaving in mass-production songkets. This situation has made the traditional Malaysian songket unable to compete in price, quantity, and consumer satisfaction (Kheng and Ngo, 2010; Ngo, 2007; Zhang et al., 2019).

Ismail (1997) discussed that the advancement of science and technology should not neglect preserving our cultural and traditional values. Wattanapun (2010) stated that traditional art and crafts showed flourishing past civilisations where the products presented high skills, creativity, devotion, persistence, and affluence

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intrinsically in every effort put. However, traditional crafts are less valued nowadays. According to Levine and Heimerl (2008), traditional crafts are experiencing a revival in the low-cost mass production field. Nowadays, artisans and craft collectors may have preferences for new, innovative designs that have more variations and functionality. In line with the new technologies, more technicalities in design aspects (forms, shape, materials, and finishing) can only be achieved in contemporary and innovative designs, other than traditional designs. Although traditional designs promoted values and were designed with simple motifs directly depicted in natural elements, they might not be favourable to modern consumers, and this could lead to the extinction of original craft arts. Esa (1997) questioned why many artists, arts and crafts enthusiasts, and the community succumbed to the influence of contemporary modern art despite its subversive and debilitating effects on tradition. A question on the perceptiveness and values of art and design would need to be further clarified. Whether it is adequate for the community arts and crafts to invest a lot of effort in order to encourage the production of cultural products remains uncertain.

Syed Kamarulzaman et al. (2022) discussed the physical deterioration of the two traditional Malay textile songket preserved by the Department of Museums Malaysia, while Janpourtaher (2019) deliberated on preservation treatment and restoration procedures for historical royal songket sarong. Jamil (2014) investigated how image processing enhances and binaries songket themes. The following functions of image processing in the preservation of songket motifs are used: 1) image cropping, scaling, morphological reconstructions, and grayscale conversion are used to extract songket themes from cloth; 2) to improve the appearance of the extracted songket theme, histogram stretching and equalisation are used; 3) image capture noise is decreased using noise removal filters; 4) the cleaned songket themes are transformed into binary form; and finally, 5) numerous morphological processes are used on the black and white songket motifs to obtain the most accurate representations.

This research project elaborates on the use of songket motifs in everyday products. Various studies on songket documented are towards the preservation of the traditional fabrics, materials, costumes, and industries of making songket. However, this project is trying to look at other potential uses of songket motifs and cultivate new alternatives to enhance the use of songket motifs. This publication is part of a study on songket motifs, familiarity, preferences, and their potential application to everyday designs, which was executed to gain feedback from Malaysian respondents.

This paper is divided into five main sections, which are: 1) the introduction of songket design in Malaysia and the relevant issues. 2) A literature review on the definition of songket, types of motifs in songket design, related previous studies, related crafts products in the Asian region, and cultural hybridity 3) the methodology used to perform the research, followed by 4) the results and discussion from the survey, and finally 5) discussion on proposed products using AI, conclusions, and outlook on future research and related projects.

1.1 Research Aim

The main purpose of this study is to find out the perceptions and preferences of potential users with regard to the adaptation of cultural elements and songket motifs in product design, especially in daily- use products. The intended potential users are current or future consumers who are interested in innovative cultural product designs. The project also identifies the familiar motifs of songket design through image selection based on well-known motifs commonly used in songket design. Moreover, samples of designs embedded with songket motifs or inspired by songket motifs will be proposed at the end of this paper using AI.

2. LITERATURE REVIEW

2.1 Malaysian crafts, songket and crafts in other regions

Developed countries like the UK, European countries, Australia, and China have pushed for policies to support the “cultural industries” or “creative industries” in order to boost and diversify their economies (Cunningham, 2002; Garnham, 2005; Hui, 2006; Hesmondhalgh, 2008). This is true even though cultural understanding and geographical context are different. In the same way, the Malaysian government has worked to support the growth of the craft industry by starting programmes like (1) One District, One Industry (Satu Daerah Satu Industry (SDSI)), which focuses on the types of crafts made in certain districts; (2) Incubator Scheme, which helps young entrepreneurs succeed until they can run their own businesses; and (3) Upgrading of Craft Entrepreneur, which helps the business grow (Mat Amin, 2006).

The implication Malaysian crafts face nowadays is the extinction of cultural products as a result of modernisation and may also because the historical development of Malaysian cultural crafts may involve a small number of craftsmen and designers. Thus, the public’s in-depth knowledge of design aesthetics and values is unknown. A study by Arifin, Abdul Rahman, and Masron (2010) on the preservation of *Labu Sayong* (Water Pitcher) shows that there is an urgent need for Malaysian policymakers, designers, artists, and other art enthusiasts to take further action to improve the future perspectives of Malaysian craft industries. The Malaysian craft industry can be divided into four major categories: textile, forestry, earthen, and metal and mineral (Mat Amin, 2006). The craft industry, according to Mat Amin (2006), is defined as individuals or companies involved in the design, production, or marketing of products that are made entirely by hand or with simple tools and are utilitarian, aesthetic, artistic, creative, culturally attached, decorative, functional, traditional, and religiously symbolic.

Songket is a Malay word that means bringing out or pulling a thread from a background cloth or weaving using gold and silver thread (Nawawi, 1989). Moreover, Siok Kheng et al. (2010) describe songket as a traditional Malay fabric made of silk or cotton threads with colourful metallic thread motifs. Rokiah Embong (2010) elucidated that songket comes from the Malay word *menyongket* (or menyungkit), which means ‘to lever up’ or pick the patterns by

inserting a fine bamboo stick. Menyongket (meaning to embroider) is a technique where metallic threads are inserted and woven into the cloth to create songket motifs. Songket weaving is a laborious and tedious process that requires the weaver's full attention. According to Wahid (2017), the songket weaving process is divided into the following steps: designing, dyeing, winding, making a warp, rolling, sleying the reed, setting up the loom, setting up a double heddle, picking up the pattern, saving the pattern, and finally, weaving. This unique fabric is woven on a handloom by inserting coloured metallic threads through the silk or cotton threads that have been handcrafted for more than two centuries in South Asia and passed down through generations (Zhang et al., 2019).

Previously, Azizi Bahauddin (2002) examined Malay songket motifs in relation to Malaysia's cultural identity through the government's National Culture lens, concluding that assimilations with Hindu-Buddhist and Islamic influences occurred in the traditional songket motifs. This claim is also supported by Rokiah Embong (2010) and Nawawi (2002). Nowadays, numerous Malay traditional rites and rituals still use songket. Zhang et al. (2019) stated that most Malay people still wear clothes made of songket fabric during special occasions, such as wedding ceremonies, religious festivals, and social and national functions, making the fabric in demand. Previously, Siok Kheng et al. (2010) and Embong (2010) claimed that songket has only been designed into clothing items (fashion wear, shawls), fashion accessories (handbags), and home furnishing products (mats, cushions, table runners, and gift items) in recent times. Handwoven songket has also been getting a makeover in design, where contemporary motifs and colours are used and new materials are incorporated, such as light-weight songket fabric made of silk, organza, and crepe. Moreover, Nawawi and Legino (2016) proposed how the Malay songket may be used as modern art and design and applied as current patterns in commercial products like soft home furnishings. New designs are being researched using different looms for faster manufacturing and other materials for unique aesthetics. The current study by Daud and Abidin (2022) proposed the usage of songket motifs to create geometric Islamic artworks. On the other hand, Morni et al. (2021) stated that the identification process has determined that the traditional Malay songket motifs of Sarawak (Borneo) originate primarily from a variety of floral sources, reflecting and inspired by nature where Morni highlighted the various Malay songket motifs that can be found in Sarawak, which are representative of the state's rich textile heritage. Moreover, these approaches to songket functionality and practicality make songket gain recognition in society at both domestic and international levels. Furthermore, Zhang et al. (2019) discussed designing the supply chain infrastructure of Malay handwoven songket in Terengganu, while Yusof, Yusof, and Ibrahim (2018) investigated the linkage between heritage and tourism in Malaysian songket designs.

In relation to songket motifs and designs in the Southeast Asian region, mainly Indonesia, various studies are implemented concurrently, including a study on Batu Bara Malay songket on the history, motifs, and functionality (Wati, Irwansyah, and Devianty, 2022). Moreover, Pebryani, Ratna, and Prihatini (2022) conducted research on the design application for Balinese songket weaving motif, while Ramadhanuet al. (2022) reviewed the development of the affine transformation method in the reconstruction of the songket motif, and Rigitta (2022) focused on the traditional language of Langkat Malay songket motifs. These listed works of literature are among the latest contributions in the field of songket design in the Malay archipelagos.

Developed nations such as the United Kingdom, European countries, Australia, and China have enacted policies aimed at bolstering and broadening their economies by providing support to cultural and creative industries. Malaysian crafts encounter obstacles such as the disappearance of cultural artefacts as a result of industrialization and the general public's low understanding of design aesthetics and values. Ultimately, Malaysian craft businesses face difficulties due to industrialization and the disappearance of cultural artifacts. It is imperative for policymakers, designers, artists, and art aficionados to take additional measures to enhance the future prospects of these businesses.

2.2 The motifs of songket

Bahauddin (2002) classified songket motifs into seven categories: themes originating from flora and wildlife that have been stylised in accordance with Islamic religious regulations, foods, nature, and significant court artefacts. To fully appreciate the meaning included in the motifs, one must evaluate their placement within the songket design patterns. Moreover, according to Bahauddin (2002), plants are frequently depicted in Malay art because they are considered to have healing powers. Plant-based motifs were infused with animist beliefs, which Hindu-Buddhist and Islamic philosophies later adopted. Spices, such as cloves and star anise, are other sources that inspired the prominent motifs used in songket design, such as the use of bamboo sprouts. Historically, spices were the primary source of money and power that fueled European-Malay hostilities. Additionally, the Malay people have utilised the medicinal properties of these plants and have successfully used all parts of plants: the flowers, roots, leaves, fruits, bark, and even seeds (Bahauddin & Aldrin, 2003).

According to Embong (2010), the majority of traditional weavers live in rural areas near nature, and as a result, they can capture the intricate designs seen in their surroundings and incorporate them as motifs and patterns into their weaving. The list of motifs is listed below.

1. *Local flora and surroundings* (e.g., *bunga cengkih* (cloves), *bunga tampuk buah kesemak* (corolla of persimmon fruit), *bunga tampuk manggis* (corolla of mangosteen) and *pucuk rebung* (bamboo shoot))
2. *Local fauna and surroundings* (e.g., *gigi yu* (shark's teeth), *rantai dada lipan* (centipede's chest chain), *lawi ayam* (cockerel's tail feathers), *rantai unduk-unduk* (a chain of seahorse))

3. *Villagers' activities* (e.g., *bunga tiga dara* (three maidens), *tapak catur* (chessboard), *bunga pitis* (a square-shaped Kelantanese coin))
4. *Natural environments* (e.g., *awan larat* (trailing clouds), *teluk berantai* (bays or lagoons along the coastline or curves in rivers), *jong sarat* (the well-laden junk))
5. *Religion and the cosmos* (e.g., *lidah bota* (the demon's tongue), *bunga semangat* (inspirational flower), *bintang beralih* (the changing star), *bunga sinar matahari* (flower of sunshine))
6. *Malay sweet delicacies* (e.g., bunga potong wajik (diamond-shaped glutinous rice cake), bunga tepung talam (also a diamond-shaped cake) and bunga madu manis (honey-sweet cake)).

The fact that Malays are Islam, realistic images of animals and humans are discouraged in their artistic expression; the majority of songket themes are geometrical (Nawawi, 2002).

Table 1 below shows the selected common songket motifs used in the survey for this study. These motifs were traced and refined using Adobe Illustrator (Ai) CS5 from the referenced motifs in previous studies (Nawawi, 2002). The table categorises the motifs according to the type of motifs, such as 1)

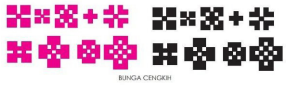
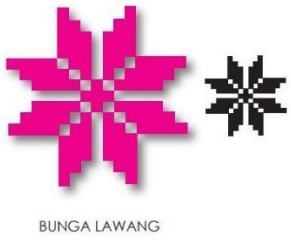
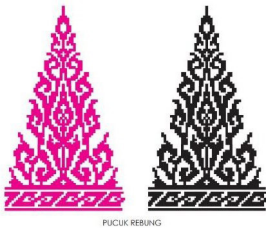
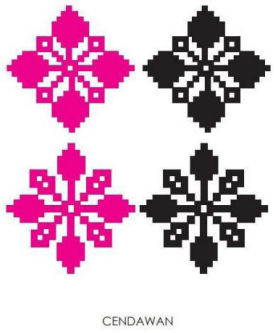
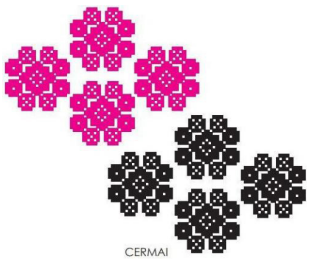
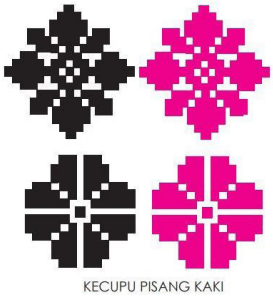
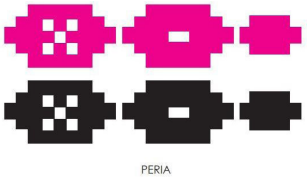
flower or plant motifs, 2) fruit motifs, 3) fauna motifs, 4) cosmos motifs, and 5) earth and sea motifs. The authors trace and polish these motifs.

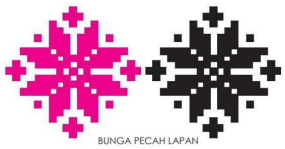
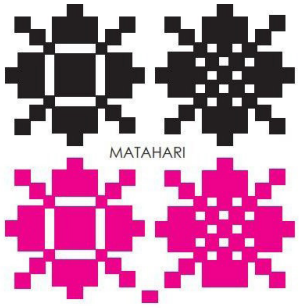
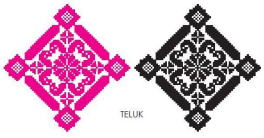
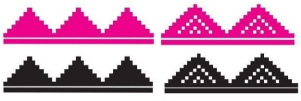
For the *Flower/ Plant motifs*, the motifs consist of the Syzgium aromaticum (Clover/Bunga cengkih), Mimusops elengi (Spanish Cherry/Bunga tanjung), Jasminum sambac (Jasmine/ Bunga Melur) Illicium verum (Star anise/ Bunga lawang), Dendrocalamus asper (bamboo shoots/ Pucuk rebung) and Fungi (Cendawan).

For *Fruit motifs*, the motifs include Garcinia mangostana (mangosteen/ tampuk manggis), Phyllantus acidus (Malay Gooseberry/ Cermai), Garcinia prainiana (Persimmon/ Kecupu/ pisang kaki) and Momordica charantia (Bitter gourd/ Peria).

For *Fauna Motifs*, Fish fin (Sirip ikan) and Siku Keluang (batwings). The *Cosmos motifs* consist of Star (Bunga pecah lapan/ bintang) and Sun (Matahari). And finally, Bay or Gulf (Teluk) and Mountain (Gunung) for the *Earth and sea motifs*. All of these motifs were chosen based on the researcher's familiarity and are considered well-known from experience owning songket fabrics.

Table 1: *Selected songket motifs created with Adobe Illustrator (Ai) CS5 used in the survey.*

The selective songket motifs in the survey	
1) Flower/ Plant motifs	
Syzgium aromaticum (Clover/Bunga cengkih):	Mimusops elengi (Spanish Cherry/Bunga tanjung):
	
Jasminum sambac (Jasmine/ Bunga Melur):	Illicium verum (Star anise/ Bunga lawang):
	
Dendrocalamus asper (bamboo shoots/ Pucuk rebung):	Fungi (Mushroom/ Cendawan):
	
2) Fruit motifs	
Garcinia mangostana (mangosteen/ tampuk manggis):	Phyllantus acidus (Malay Gooseberry/ Cermai):
	
Garcinia prainiana (Persimmon/ Kecupu/ pisang kaki):	Momordica charantia (Bitter gourd/ Peria):
	

3) Fauna Motifs	
Sirip ikan (Fish fin):	Siku Keluang (Batwings):
	
4) Cosmos motifs	
Bunga pecah lapan/ bintang (Star):	Matahari (Sun):
	
5) **Earth and sea motifs**	
Teluk (Bay or Gulf):	Gunung (Mountain):
	

Rural weavers weave exquisite motifs inspired by their environment, as demonstrated visually above as in Table 1. Malays, being Islamic, tend to design most songket motifs in a more geometrical style.

2.3 Cultural hybridity in contemporary design

Nowadays, artists and designers are carefully and inventively working and developing new ways to combine traditional and contemporary elements into different contexts or mediums (Papastergiadis, 2005). Papastergiadis (2005) also argued about the significance of hybridity in cultural identity. *Hybridity* can be defined as the fusion of cultural elements into an identity or the incorporation of foreign elements into the culture. Thus, in this context of the study, the integration of new technologies, knowledge, and materials with cultural elements can be seen as another genre that can

be further explored. The cultural products will go through several transformations or developments to be integrated into the new innovative design, as the authors intended to do. The idea of incorporating cultural elements into daily product design is another way of preserving the cultural product identity without distressing the philosophy or the intrinsic meaning of the cultural product. Another example led by the Delegation of the European Union to the United States of America (2018) is preserving cultural heritage through innovation by showcasing the convergence of culture, science, and technology through virtual reality (VR). This event is vital as a way to trace European ancestry and origins. The cultural elements can be merged with technology to foster a sense of belonging and empathy towards cultural and social issues. Moreover, a case study investigated by Bernabei and Power (2018) on how the user-completion model is reinventing craft through the application of digital manufacturing technology in design disciplines.

Artists and designers are merging traditional and contemporary aspects in different settings, with a specific emphasis on the blending of cultural identities. This entails the integration of novel technologies, information, and materials with cultural components for the conservation of cultural heritage.

2.3.1 The application of cultural motifs in everyday design

This section discussed the application of cultural motifs in everyday design based on studies done around the Southeast Asia region. These relevant literature findings have been used as references to identify the main direction of this study. Sayuti et al. (2018) proposed the application of batik motifs in porcelain ware design. The motifs of Batik used in this research are taken from Batik Merbok motifs, which were inspired by the historical artefacts of the Bujang Valley, which dominates the Kedah region in the northern part of Malaysia. The proposed ideas were presented using 3D software (Figure 1).

A similar study by Ayob and Jusilin (2016) applied an ethnic Borneo motif, *Linangkit*, to a contemporary ceramic design and was an initiative to preserve the national cultural heritage. Another similar study on Taiwanese aboriginal cultures in modern ceramic product designs depicted Rung-Tai's cultures, histories, and nature (2007). Meanwhile, in Cambodia, Kang (2016) conducted a study to improve ceramic production and trade for the handcrafting community. Furthermore, relevant research by Jung et al. (2014) on the cultural identity found in tote bags focused on Korean Hanbok motifs, while Saddhono et al. (2015) discussed the study of the philosophical meaning of batik and kimono

motifs to foster a collaborative creative industry. Moreover, Syed Shaharuddin et al. (2021) did a review of 21st-century Malaysian and Indonesian batik productions.

Among the related latest studies on cultural and traditional products, including motifs of 'Jebak Puyuh' (quail bird motifs) in weaving and wood carving by Shaharudin et al. (2022) and the development of fashion cultural product design based on four auspicious animals in Korean folk painting by Kim (2019), Liang (2022) discusses the aesthetic value evaluation and the adoption of digital technology in the cultural and creative industries, while Li and Li (2022) investigate the influence of design aesthetics on consumers' purchase intentions towards cultural and creative products. Moreover, Suib, Van Engelen, and Crul (2020) reviewed the knowledge and collaboration between craftspeople and designers, whereas Qin and Ng (2020) discussed the development of a metaphorical framework for designing products with traditional cultural properties (TCPs).

Figure 1: *The example of the visualisation of batik motifs in porcelain ware using 3D software from Sayuti et al. (2018)*

The previous studies demonstrate the impact of cultural elements on the design aesthetics, values, and acceptances of potential consumers, which in turn provide a philosophical and intrinsic meaning to product designs.

2.4 Industrial Design

As industrial design is involved in developing or creating everyday designs, it is crucial to discuss this topic and its relevancy in regard to the application of cultural motifs or patterns in everyday designs. This section discussed the global role of industrial design and how product designs appeal to consumers with aesthetics, semantics, and practicality.

Consumers worldwide are using products, devices, objects, and services derived from the professional practice of industrial design. Bajuri (2007) defined this discipline as a practice that involved analysing, creating, and developing products for mass manufacturers, whose main aim is to achieve form and functionality with collaborative investments by the stakeholders. Industrial design has developed into a diversified design field that not only caters to producing products like furniture and automotive but also other high-technology products. The Industrial Designers Society of America (IDSA) (2023) defines industrial design as a professional service that maximises function, value, and aesthetics for both users and manufacturers. In addition, industrial design involves the consideration of environments, materials, and target consumers. Unlike architects or engineers, industrial designers usually focus on smaller-scale tangible objects that users may buy and use every day. Moreover, the definition of industrial design, according to the World Design Organisation (WDO) (2023), is a strategic problem-solving approach that leads to better products, systems, services, and experiences in UI/UX to improve a product, system, service, experience, or business by using creativity to address problems and co-create solutions. A new value and competitive advantage are created by linking innovation, technology, research, business, and customers.

Identifying trends, possibilities, societal dynamics, and technology for new and useful products or services is part of the industrial designer's job description. Industrial designers are responsible for innovating the future (Verlinden, 2015). Industrial design has existed since its inception, and there has been an abundance of knowledge pertaining to the history of industrial design available. Starting with the Industrial Revolution, which began in Britain between 1760 and 1840 and resulted in the introduction of powered, special-purpose machinery, factories, and mass production (Goldense, 2019), the timeline continues until the Professional Practice Committee presents an updated definition of industrial design as a strategic problem-solving process that fosters innovation, promotes corporate success, and contributes to a higher standard of living through creative products, systems, and services (CHOI Design Group, 2017).

Consumers are enticed by new inventive products (Radford and Bloch, 2011), and they also place a great value on products designed for a particular function or usage, as well as those with improved aesthetics (Veryzer, 1993; Yamamoto and Lambert, 1994; Bloch, 1995; Creusen and Schoormans, 2005). Colours, forms, and materials used in well-designed items appeal to consumers' senses as well as their practical needs. All these factors may induce a sense of contentment. Products that are visually appealing not only captivate the eye but also communicate with prospective consumers about their functionalities, trends, and other visual attributes. Relevant studies on product aesthetics, semantics, styling, customer needs, and design specifications in design are by Crilly et al. (2004), Govers and Schoormans (2005), Zuo and Jones (2007), Boess (2008), Krippendorff (2008), Mugge, Govers, and Schoormans (2008), Lawson and Storer (2008), Blijlevens et al. (2009), Hagtvedt and Patrick (2014), Bonollo (2015), and Wang, Luo, and Liu (2020).

This paper proposes the use of songket motifs in everyday product designs to preserve national heritage, and furthermore, it could open up a possibility for more studies on the exploration of the impact of culture in innovative product design.

2.5 Introduction to AI and Generative AI Models

The proliferation of visual representations generated by artificial intelligence (AI) has undeniably garnered significant interest across diverse sectors of society. The utilisation of AI-powered software and solutions has been prevalent across domains such as idea generation, marketing, publishing, and innovation creation due to their ability to produce realistic photographs and maintain image quality that meets the criteria set by designers and photographers. The concept of

"AI" was initially coined by John McCarthy, a prominent figure in computer science, in 1956. Since then, the field of AI has undergone significant advancements, transitioning from rule-based technology in the 1960s to its current state in 2023 (Ziyad, 2019). Presently, AI technology has the capacity to generate, analyse, record, and autonomously make judgements.

Additionally, Luckin and Holmes (2016) integrate artificial intelligence (AI) into multiple domains of scientific inquiry, such as science, biology, language, philosophy, and neuroscience. It is worth noting that two distinct categories of artificial intelligence (AI) exist (Bartneck et al., 2021a; Bartneck et al., 2021b; Kulkarni et al., 2023; Tsao et al., 2023). The first category, "Narrow AI," represents a less advanced form of AI that functions within predetermined parameters or task-specific data. A prominent example of narrow AI is Apple's voice assistant Siri, which operates within its prescribed limitations by adhering to given instructions. On the other hand, the second category, referred to as "Strong AI" or "AI General," encompasses artificial intelligence systems that possess the capability to analyse, make autonomous decisions, and act without the need for explicit instructions. Artificial intelligence (AI) has further enhanced creativity by providing a convenient platform for its quick development since the introduction of internet technology.

Each generative AI picture production platform has its strengths and drawbacks, especially in image quality, generated image structure, and data-based accuracy. Ian Goodfellow, the inventor of deep learning in AI, popularised the generative image model, especially GANs (Heaton et al., 2017). Two neural networks work oppositely to generate realistic, rapid images with GANs. The generator and discriminator of GANs oppose picture formation. GANs generate images in several stages (Goodfellow et al., 2014; Esfahani et al., 2019a; Heaton, 2019): 1) The Generator's Function: The generator uses "Latent Representation Image" to create fake images using latent vector or latent code data. This technique passes through numerous neural network layers to produce a high-resolution image. These layers become more sophisticated with each photograph. 2) Discriminator: the "image judge" component. Its primary objective is to determine if the generated images are realistic or fake. The created images get more realistic as the discriminator struggles to differentiate between actual and fake ones.

Furthermore, the general creation of artificial intelligence images comprises multiple steps, such as: 1) *determining the prompt*, which guides the generator to find the required image qualities. The prompt can provide simple or complex language as guidance. 2) *Input to the generator model*; the data prompt is loaded into the generator model, depending on the user's tastes and needs. 3) *A latent vector* is a mathematical algorithm that organises visual data to create the desired image. 4) *Discriminator assessment*: checks that generated images meet dataset rules based on established score criteria. 5) *Iteration and feedback process:* Thorough refining leads to final image production. 6) *Final generative image generation*; data prompt instructions are satisfied, resulting in the generator model's best image combination.

For this study, the investigators employed a generative AI model, an artificial intelligence system specifically developed to produce images based on input parameters and terminologies that represent the attributes of an image (please refer to Table 9 in the discussion section). Generative artificial intelligence (AI) refers to a branch of machine learning that can undergo training by utilising model images, comprehensive datasets pertaining to specific images, and various styles (Oppenlaender, 2022). The capacity to produce artificial intelligence-generated photographs autonomously, without the need for equipment, human intervention, or physical settings, contributes to cost savings within the sector.

3. METHODOLOGY

The research project employed an exploratory sequential mixed methods and progressed through 10 distinct stages. The research procedure was formulated using an exploratory qualitative approach on the identification and observation of songket motifs, followed by an exploratory quantitative approach utilising a questionnaire survey in the subsequent phases (McBride et al. 2019). The first step involved conducting research on pertinent subjects and conducting a literature review (LR); the second step involved identifying and selecting study themes from the LR. Moreover, researchers used Adobe Illustrator CS5 to retrace and restructure the motifs for the survey (refer to Table 1). 3) Next, researchers structured the questionnaire and subdivided it into three sections (please refer to Table 2).

4) The online survey was set up in correspondence with the chosen online survey platform; 5) The ethical approval to conduct a research survey was obtained from the ethical commission, RCA London, in August 2020; 6) Next, the online survey was tested, and 7) it was disseminated through social media, emails, and other platforms. 8) The results gathered from the survey to identify the songket motifs towards familiarity, preferences, and potential application into product design were analysed. 9) Proposals for innovative cultural product designs are developed using AI software and are discussed in the final section; and 10) is the conclusion and outlook on future research projects. The research design process was developed and Figure 2 shows the main process of the empirical research design process.

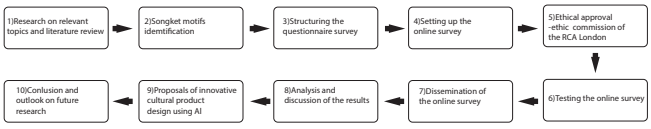


Figure 2: *The Research Design Process*

3.1 Questionnaire Design

The questionnaire was circulated among Malaysians from a various working background and education levels (please refer to Table 3). Participants were recruited through social media, and the survey

was also disseminated through emails. Participation was voluntary, and a participant could withdraw at any point in the survey. This current work focuses on those 219 respondents who own, use, or have an interest in songket design. Eleven questions on the songket motifs, preferences, familiarity, and potential future innovation were designed to investigate potential consumers' opinions. This survey consisted of three main sections: *A) Respondent background; B) The appreciation of songket design; C) The incorporation of cultural elements in product design—embedding songket motifs into daily-use products.* The questionnaire consisted of visual imagery of songket motifs, allowing respondents to choose familiar and preferred motifs. A total of 219 responses were collected and analysed for this paper.

The questionnaire (see Table below) was asked using a 5-point Likert scale ((1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree), yes/no format, multiple-answer format, and an open-ended format. The 5-point Likert scale was used to rate the level of agreement and disagreement (Matell and Jacoby 1972; Albaum 1997; Johns 2010). The results can be seen in Table 1a, and b–4a, b, and c below are the descriptive analyses of the mean value of the SPSS test. A mean score uses the scale of a negative rating (e.g., disagreement). Strongly Disagree: -2, Disagree: -1, Neutral: 0, Positive integers indicate an overall positive rating. Agree: 1 and strongly agree: 2 (e.g., agreement).

Table 2: *The list of questions sample for the online survey*

The list of questions	Format
Q1: Your opinion on Songket (in apparels, textiles, wearable products, or other products available in the market): A cultural product which embodies Malay culture A fine, luxury and expensive garment or craft Affordable depending on designs, motifs and materials Occasionally use Show a high quality of artistry, beautifully crafted Have a global-cultural potential	Likert scale: (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree
Q2: Your opinion on Songket motifs: Unique and different from other craft products in this region Beautifully and intricately woven or crafted Symbolise the traditional Malay culture and value Showing the skills and creativity of the Malay artisan in arts and crafts Depicted and translated the natural elements effectively Shows the appreciation of natural elements which mainly inspired the motifs	Likert scale: (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree
Q3: Are you familiar with Songket motifs?	Yes/ No format
Q4: Which group of Songket motifs are you most familiar with? (You may answer more than 1). 5 groups of songket**:** flower, fruit, fauna, cosmos, earth and sea	Multiple answers format
Q5: Which Songket motifs do you know? (You may answer more than 1). The name of 16 Songket motifs was provided**.**	Multiple answers format (no images included)
Q6: Which motif(s) do you prefer the most? (You may choose up to 5 answers). The name and images of 16 Songket motifs were provided**.**	Multiple answers format (Contain visual images of songket motifs as in Table 1 above)
Q7: What is your opinion on the application of Songket motifs in daily-use products?	Likert scale: (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree
Q8: Which product do you prefer to be combined with Songket motifs? (You may choose more than 1) Homeware and kitchenware products (for baking, eating, doing tasks, etc.), Home furnishing (Soft features and decorative items), Stationary (Art and craft tools, school-educational products, hobbies and interests), Fashionable items or accessories (personal use, collectables, souvenirs, etc.) and Other.	Multiple answers format
Q9: Do you think the application of traditional elements in product designs could help bring Malaysia's cultural identity to the global market?	Likert scale: (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree
Q10: Do you think that in order to prolong Malaysian cultural and craft products, it is crucial for designers, artists, and crafters to explore the possibility of integrating cultural elements into new product innovations?	Likert scale: (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree
Q11: Please provide suggestion(s) or opinion on cultural hybridity in product design, especially embedded with traditional motives or elements	Open-ended format

4. RESULTS & DISCUSSION

4.1 Section A: Respondent's background

A total of 219 responses from Malaysians were received and analysed for this paper. Background data were collected on *gender* (69.9% of females and 30.1% of males). The respondents are mainly from education and academics (42.9%), followed by the Art and Design/ Creative with 14.2%, and 11.0% of students with the highest working background. Moreover, the highest respondents' educational backgrounds are postgraduate (69.6%), followed by undergraduate (16.6%). The detailed information on the respondent's background can be seen in Table 3 below.

Table 3: *Respondent's background*

Respondents' background			
		Total number	Percent
Gender	Male	66	30.1%
	Female	153	69.9%
	Total	219	100
Working Background	Art and Design/ Creative	31	14.2%
	Education/ Academic	94	42.9%
	Finance/ Banking/ Marketing	10	4.6%
	Government/ Civil Service	15	6.8%
	IT/ Computers/ Technologies	6	2.7%
	Medical/ Dental	5	2.3%
	Technical/ Science/ Engineering	19	8.7%
	Student	24	11%
	Unemployed	7	3.2%
	Retired	3	1.4%
	Other	5	2.3%
	Total	219	100
Education Background	Postgraduate	151	69.6%
	Undergraduate	36	16.6%
	Certificate	15	6.9%
	Other	15	6.9%
	Total	219	100

4.2 Section B: The appreciation of *songket* motifs

Opinion on Songket (in apparel, textiles, wearable products, or other products available in the market)

The responses were analysed to understand the opinion and appreciation towards songket. The descriptive analysis of the mean analysis from the findings showed that six (6) opinions received an overall positive level of mean scores above 0.5 rating which is more than neutral. All of the opinions received are leaning towards agreement. These results can be seen in Table 4a below.

Table 4a: *The mean analysis of the opinion on songket*

Descriptive Statistics			
Question 1: Your opinion on Songket (in apparels, textiles, wearable products, or other products available in the market)	**N**	**Mean**	**Std. Deviation**
A cultural product which embodies Malay culture		1.2466	.93525
A fine, luxury and expensive garment or craft		1.0822	1.03720
Affordable depending on designs, motifs and materials	219	.7352	.97359
Occasionally use		.7945	1.04432
Shows a high quality of artistry, beautifully crafted		1.2603	.95822
Have a global-cultural potential		1.2283	1.00591
Valid N (listwise)			

The ANOVA test was applied to compare the significant differences in the mean opinion of respondents by comparing those with gender, working background, and educational background. From Table 4b, all categories in the respondent's background, i.e., the sig. value (below 0.05), have 0.000 for all opinions under the working background, 0.000 and 0.045 for all opinions under the education background, and 0.000 and 0.10 for opinions on a cultural product that embodies Malay culture and a fine, luxury, and expensive garment or craft under the gender, respectively. Surprisingly, the results were significant for the agreement on this question.

Table 4b: *The ANOVA analysis of the opinion on songket*

ANOVA						
Question 1: Your opinion on Songket (in apparels, textiles,	**gender**		**working background**		**Education background**	
wearable products, or other products available in the market)	F	Sig.	F	Sig.	F	Sig.
1) A cultural product which embodies Malay culture	6.739		5.047		12.273	.000
2) A fine, luxury and expensive garment or craft	13.796		4.740		9.288	.000
3) Affordable depending on designs, motifs and materials	.696	.405	1.553	.123	2.732	.045
4) Occasionally use	3.635	.058	3.351	.000	8.059	.000
5) Show a high quality of artistry, beautifully crafted	2.978	.086	4.854	.000	8.655	.000
6) Have a global-cultural potential	3.706	.056	3.937	.000	8.439	.000

The non-parametric test (Mann-Whitney) was conducted because of the unequal distribution of the number of respondent groups. The respondents are analysed by gender, working background, and education. The Mann-Whitney test has verified the significance value for all opinions except for *affordable depending on designs, motifs, and materials and shows a high quality of artistry, beautifully crafted* as the significance value is more than 0.05, as seen in Table 4c below.

Table 4c: *The non-parametric analysis of the opinion on songket*

Kruskal Wallis Test/ Nonparametric						
Question 1: Opinion on Songket (in apparels, textiles, wearable products or other products available in the market)	1) A cultural product which embodies Malay culture	2) A fine, luxury and expensive garment or craft	3) Affordable depending on designs, motifs and materials	4) Occasional use	5) Show a high quality of artistry, beautifully crafted	6) Have a global-cultural potential
Grouping Variable: Gender						
Kruskal-Wallis H	4.598	15.220	.281	4.350	1.536	4.199
Asymp. Sig.	.032	.000	.596	.037	.215	.040
Grouping Variable: Working Background						
Kruskal-Wallis H	43.046	35.233	13.425	29.328	30.745	29.854
Asymp. Sig.	.000	.000	.201	.001	.001	.001
Grouping Variable: Education Background						
Kruskal-Wallis H	35.209	26.121	8.850	23.898	19.846	21.099
Asymp. Sig.	.000	.000	.031	.000	.000	.000

4.2.1 Opinion on songket motifs

This question asks about the motifs or patterns used in the songket design. The responses were analysed to understand the opinions on the motifs using the ANOVA test to compare the significant differences in the mean opinion of respondents by comparing those with gender, working background, and educational background. The question on opinions on songket motifs consists of the following: a) unique and different from other craft products in this region; b) beautifully and intricately woven or crafted; c) symbolise the traditional Malay culture and value; d) show the skills and creativity of the Malay artisan in arts and crafts; e) depict and translate the natural elements effectively; and f) show the appreciation of the natural elements that mainly inspired the motifs. From Table 5a below, all respondents' background categories received a sig. value (below 0.05) of 0.000, 0.001, and 0.002 for all opinions under the working background. Education background also received various sig. values (below 0.05) with 0.000, 0.001, 0.003, 0.004, 0.008, and 0.015 for opinions, respectively. However, gender background shows no significant value.

Table 5a: *The ANOVA analysis of the opinion on songket motifs*

ANOVA						
Question 2: Opinion on Songket motifs	gender		working background		Education background	
	F	Sig.	F	Sig.	F	Sig.
1) Unique and different from other craft products in this region	1.056	.305	3.958	.000	3.556	.015
2) Beautifully and intricately woven or crafted	.083	.773	3.231	.001	4.668	.004
3) Symbolise the traditional Malay culture and value	2.943	.088	2.929	.002	4.073	.008
4) Showing the skills and creativity of the Malay artisan in arts and crafts	2.991	.085	3.052	.001	4.895	.003
5) Depicted and translated the natural elements effectively	1.308	.254	3.649	.000	8.895	.000
6) Shows the appreciation of natural elements which mainly inspired the motifs	.504	.478	3.880	.000	5.695	.001

The Mann-Whitney test has verified the significance value for working background and education background only because there is no significant value for age and gender groups. The significance value for working background and education background is less than 0.05 for all opinions, as seen in Table 5b below.

Table 5b*: The Kruskal Wallis Test/ Nonparametric analysis of the opinion on songket motifs.*

Kruskal Wallis Test/ Nonparametric						
Question 2: Opinion on Songket motifs	1) Unique and different from other craft products in this region	2) Beautifully and intricately woven or crafted	3) Symbolise the traditional Malay culture and value	4) Showing the skills and creativity of the Malay artisan in arts and crafts	5) Depicted and translated the natural elements effectively	6) Shows the appreciation of natural elements which mainly inspired the motives
Grouping Variable: Working Background						
Kruskal-Wallis H	24.475	25.926	19.873	21.206	31.343	32.380
Asymp. Sig.	.006	.004	.030	.020	.001	.000
Grouping Variable: Education Background						
Kruskal-Wallis H	8.930	16.267	12.126	13.434	24.482	17.469
Asymp. Sig.	.030	.001	.007	.004	.000	.001

4.2.2 Familiarity of songket motifs

From Table 6a below, the results show that 69.9% of the respondents are familiar with the songket motifs, while 30.1% are not. The motifs have been divided into five (5) categories, which are: a*) flower motifs; b) fruit motifs; c) fauna motifs; d) cosmos motifs;* and *e) earth and sea motifs,* as can be seen in Table 6b below. The flower motifs received the highest percentage with 46.85% overall with 216 counts, followed by the fauna motifs with 26.03% overall with 120 counts. Cosmos received 75 counts with an overall percentage of 16.27%, and earth and sea motifs received 50 counts with a 10.85%, while fruit motifs received 0 counts and a percentage for familiarity in the songket category.

Table 6a: *The percentage of songket motifs familiarity*

Are you familiar with Songket motifs?		
	Total number	**Percentage**
No	66	30.1%
Yes	153	69.9%
Total	219	100%

Which group of Songket motifs are you most familiar with?		
	Total number	**percentage**
Flower motifs	216	46.85%
Fruit motifs	0	0%
Fauna Motifs	120	26.03%
Cosmos motifs	75	16.27%
Earth and sea motifs	50	10.85
all counts/ percentage	461	100%

Sixteen (16) motifs were used in the survey (please refer to Table 6b below). The motifs are: a) Garcinia mangostana (Tampuk Manggis); b) Garcinia prainiana (Kecupu/Pisang Kaki); c) Phyllantus acidus (Cermai); d) Momordica charantia (Peria); e) Syzgium aromaticum (Bunga cengkih); f) Jasminum sambac (Bunga Melur); g) Illicium verum (Bunga lawang); h) Mimusops elengi (Bunga tanjung); i) Star (Bunga pecah lapan/bintang); j) Sun (Matahari); k) Dendrocalamus asper (Pucuk rebung); l) Fungi (Cendawan); m) Bay or Gulf (Teluk); n) Mountain (Gunung); o) Fish fin (Sirip ikan);p) Siku Keluang.

Although the fruit motif received zero percent in the previous question on familiarity, Garcinia mangostana (Tampuk Manggis), a fruit family name for mangosteen, received the highest percentage with 16.21% and 135 counts. These findings are contradictory, as they show that the respondents do not know the exact categories to which the motif belongs. This is also because the design motif depicted the bottom part of the mangosteen, similar to an eight-petal flower (please refer to Table 1 in the motif section). This motif also received the third-highest percentage when presented in the image form in question 6. The reason why these questions were asked twice (Question 5—without images) and (Question 6—with visual images of motifs) is to identify the common knowledge on songket motifs, and clearly there are differences in the answers towards the motif preferences when the respondents were represented with images of the songket motifs, as highlighted in Table 6b below. Further discussion is in 5.0 and Table 8.

Table 6b: *The percentage on the knowledge and preference of songket motifs*

	Which Songket motifs you know? (no images of songket)		Which motif (s) that you prefer the most? (Visual images of songket motifs)	
	Total number	percentage	Total number	percentage
Garcinia mangostana (Tampuk Manggis)	135	16.21%	127	13.12%
Garcinia prainiana (Kecupu/ pisang kaki)	27	3.24%	48	4.96%
Phyllantus acidus (Cermai)	33	3.96%	76	7.85%
Momordica charantia (Peria)	7	0.84%	3	0.31%
Syzgium aromaticum (Bunga cengkih)	91	10.92%	24	2.48%
Jasminum sambac (Bunga Melur)	80	9.60%	40	4.13%
Illicium verum (Bunga lawang)	97	11.64%	147	15.19%
Mimusops elengi (Bunga tanjung)	63	7.56%	42	4.34%
Star (Bunga pecah lapan/ bintang)	84	10.08%	61	6.30%
Sun (Matahari)	32	3.84%	27	2.79%
Dendrocalamus asper (Pucuk rebung)	74	8.88%	148	15.29%
Fungi (Cendawan)	19	2.28%	73	7.54%
Bay or Gulf (Teluk)	18	2.16%	78	8.06%
Mountain (Gunung)	21	2.52%	20	2.07%
Fish fin (Sirip ikan)	26	3.12%	14	1.45%
Siku Keluang	26	3.12%	40	4.13%
Overall counts/ percentage	833	100	968	100

4.3 Section C: The Incorporation of Cultural Elements in Product Design - Embedding Songket motifs into daily - use products

Section C discusses the potential of incorporating songket motifs into daily-use products. Based on the findings from Table 7a below, 59.4% of the respondents agree, while only 8.2% disagree with applying the songket motif to daily-use products.

Table 7a: *opinion on the application of Songket motifs in daily-use products*

What is your opinion on the application of Songket motifs in daily-use products?		
	Total number	**Percent**
Strongly Disagree	3	1.4%
Disagree	15	6.8%
Neutral	71	32.4%
Agree	86	39.3%
Strongly Agree	44	20.1%
Total	219	100

Table 7b: *preference of products to be embedded with Songket motifs.*

Which product do you prefer to be combined with Songket motifs?		
	Total number	**Percentage**
1) Homeware and kitchenware products (for baking, eating, doing tasks, etc).	52	10.66%
2) Home furnishing (Soft features and decorative items	141	28.89%
3) Stationary (Art and craft tools, school-educational products, hobbies and interests)	98	20.08%
4) Fashionable items or accessories (personal use, collectables, souvenirs, etc.)	190	38.94%
5) Other	7	1.43%
Overall counts/ percentage	488	100

Table 7b shows the highest and lowest responses for the preference of products to be embedded with Songket motifs. The highest preferences of 38.94% were received by *fashionable items or accessories (personal use, collectables, souvenirs, etc.)*, followed by *home furnishing (soft features and decorative items)* with 28.89% and *stationery (art and craft tools, school-educational products, hobbies, and interests)* with 20.08% and 10.66% for *homeware and kitchenware products (for baking, eating, doing tasks, etc.). Other products* received the lowest, with only 1.43%.

The findings in Table 7c below were analysed to understand the opinion on applying songket motifs for the global market and to prolong the cultural and craft products by combining the cultural elements into new product innovations. The descriptive analysis of the mean analysis from the findings showed that Question 9 and Question 10 received an overall positive level of mean scores. Furthermore, table 7c below summarises the findings on the opinion towards the application of songket motifs for the global market and to prolong the cultural and craft products by combining the cultural elements into new product innovations using the ANOVA test to compare the significant differences in the mean on the opinion of respondents by comparing those with gender, working background, and education background. Table 7d below shows all categories in the respondent's background, i.e., the sig. value (below 0.05) with 0.019, 0.030, and 0.001 for opinions under the category, gender, working background, and education background, respectively, for Question 9. However, for Question 10, the sig. value (below 0.05) is 0.017 and 0.001 for working background and education background, respectively, except for gender category.

Table 7c: *the ANOVA analysis of the mean value on gender, working background and education background towards the opinion and appreciation of songket*

ANOVA						
	gender		**working background**		**Education background**	
	F	**Sig.**	**F**	**Sig.**	**F**	**Sig.**
Q9: Do you think that the application of traditional elements in product designs could help to bring forward the cultural identity of Malaysia towards the global market?	5.544	.019	2.052	.030	5.727	.001
Q10: Do you think that in order to prolong the Malaysian cultural and craft products, it is crucial for designers, artist, and crafters to explore the possibility of integrating the cultural elements into new product innovations?	.349	.555	2.238	.017	5.408	.001

4.4 Discussion on the questionnaire survey

An empirical study was undertaken using an online survey to evaluate potential consumers' perceptions and preferences about the adoption of cultural aspects of songket motifs in product design, particularly in daily-use products. A customised online survey was the primary method utilised to communicate information to potential clients. The discovery of these perspectives could be used to inspire novel approaches to the development of new everyday designs, allowing data to be collected in larger quantities than traditional methods. The

study of industrial design with regard to adapting Malaysian cultural elements is currently inadequate, and we hope this paper can be referred to for further understanding in the future.

This disseminated survey consisted of two main sections: *The Appreciation of Songket Design and The Incorporation of Cultural Elements in Product Design—Embedding Songket motifs into daily-use products. The questions were aimed at eliciting potential consumers' comments on songket themes, preferences, familiarity, and potential future innovation.*

For *the Appreciation of Songket Design question section,* the responses were analysed to better understand the opinion and appreciation towards songket. The findings' descriptive analysis of the mean analysis revealed that six (6) opinions received an overall positive level of mean scores greater than 0.5. The ANOVA test shows that almost all categories, i.e., gender, working background, and educational background, received a sig. value (below 0.05). Surprisingly, the results were significant for the agreement on this question.

The results on the opinion of motifs or patterns used in the songket design were analysed using the ANOVA test, which shows a sig. value (below 0.05) for working and educational background, except for gender. These findings are also supported by the nonparametric test, where the value was significant only for working background and education background with a sig. value less than 0.05.

For the familiarity with songket motifs questions, this section was provided with images of songket motifs as in Table 1. The results contradict the findings in four questions, which are Q3, Q4, Q5, and Q6. A summary table is designed to summarise the findings from these questions (see Table 8 below).

For Q3, 69.9% of the respondents are familiar with the songket motifs. Although the motifs represented previously are quite common in the songket fabric designs, the similarity of the geometrical design might confuse the respondents. It's also possible that 30.1% of the respondents do not own songket fabrics.

For Q4, the respondents chose the flower motif with 46.85%, the highest percentage overall with 216 counts. Next, followed by the fauna motif with 26.03% overall and 120 counts. However, the fruit motif received 0%.

For Q5 and Q6, the images and a translation of the motifs are included. The findings are contradictory, as most of the respondents have chosen the fruit motif of mangosteen, or Tampuk Manggis (in the Malay language), as one of the most recognisable motifs in songket. Other popular motifs are star anise and bamboo shoots. The visual images were included to identify whether the respondents truly recognised or were truly familiar with the motifs. It can be concluded from the findings that the images or translation to the Malay language affect the results, as these motifs used in the survey might be recognised with different names.

Table 8. *The summary of familiarity of songket motifs*

Summary of Familiarity					
Q3: Are you familiar with Songket motifs?					
	Frequency		**Percentage**		
Yes	153		69.9		
Q4: Which group of Songket motifs are you most familiar with?					
	Frequency		**percentage: 100% overall**		
Flower motifs	216		46.85%		
Fruit motifs	0		0%		
Fauna motifs	120		26.03%		
Cosmos motifs	75		16.27%		
Earth and sea motifs	50		10.85		
all counts/ percentage	461		100%		
Q5 & Q6: The highest responses of motifs (top 6 answers)					
Included translation in Malay			Included images of motifs		
Garcinia mangostana mangosteen)	135	16.21%	Dendrocalamus asper (Pucuk rebung/ bamboo shoots)	148	15.29%
Illicium verum (Bunga lawang/ Star anise)	97	11.64%	Illicium verum (Bunga lawang/ star anise)	147	15.19%
Syzgium aromaticum (Bunga cengkih/ Clover)	91	10.92%	Garcinia mangostana (Tampuk Manggis/ mangosteen)	127	13.12%
Star (Bunga pecah lapan/ bintang)	84	10.08%	Bay or Gulf (Teluk)	78	8.06%
Jasminum sambac (Bunga Melur/ jasmine flower)	80	9.60%	Phyllantus acidus (Cermai)	76	7.85%
Dendrocalamus asper (Pucuk rebung/ bamboo shoots)	74	8.88%	Fungi (Cendawan/ mushroom)	73	7.54%

For the Incorporation of Cultural Elements in Product Design: Embedding Songket motifs into daily- use products, 59.3% of the respondents agree, while only 8.2% disagree with applying the songket motif to daily-use products. The interest in fashion-related items or accessories (personal use, collectibles, souvenirs, etc.) was highest at 38.94%, then home furnishings (soft features and decorative items) at 28.89%, and stationery (art and craft tools, school-educational products, hobbies and interests) at 20.08%. The ANOVA test was used to compare significant differences in respondents' opinions by gender, working status, and educational background, and the sig. value received was below 0.05, which means that the respondents agreed on utilising songket motifs for the worldwide market and blending cultural aspects into new product developments to sustain the cultural and craft products.

4.5 The application of Generative AI

Due to the expanded development and usage of AI supported by the studies by Boden (1998) on creativity and artificial intelligence, the use of brainstorming as a virtual moderator in design thinking by

Strohmann, Siemon, and Robra-Bissantz (2017), the divergent and convergent thinking of creative action using AI by Griebel, Flath, and Friesike (2020), AI-driven creative processes and human creativity enhancement (Figoli, Rampino, and Mattioli, 2022), and a study by Vladić et al. (2022) on the transformation of the product design and idea generation process influenced by modern digital technologies Furthermore, Zhu (2023) focuses on the process of designing artificial intelligence products in relation to product semantics, while Lei, Vyas, and Gupta (2022) emphasise the application of artificial intelligence (AI) in the realm of product development and process design, and previously Wang, Zhang, and Wang (2019) focused on the utilisation of artificial intelligence with inventive design in the field of product design.

For this study, the researchers used a generative AI model, a type of artificial intelligence system designed to generate images by inputting certain parameters and terminologies that depict the characteristics of an image. The ability to generate artificial intelligence images without the involvement of equipment, humans, or locations helps save various costs that would be incurred by the industry. Henceforward, the researchers have decided to use AI to envision and project the ideas of the embedment of songket motifs in product designs by exploring the AI software platform (Midjourney) to develop proposals with songket motifs on 1) homeware/ kitchenware, 2) home furnishing/decorative items, 3) stationary/arts and crafts materials and tools, 4) souvenirs or fashion accessories, and 5) the interior part of transportation design (dashboard, steering, seaters, or door panels) or other types of products.

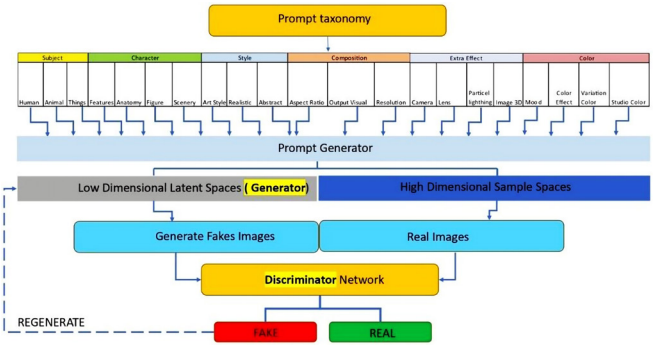


Figure 3. *The step-by-step process of Generative AI Model proposed by the researchers.*

Additionally, the step-by-step procedural AI Generative Model in this study is explained below (as seen in Figure 3 above): Firstly, image subjects of songket motifs and patterns were developed using Adobe Illustrator to be used, embedded, and generated within the Midjourney AI platform. Next, the researchers described the chosen everyday product designs based on the characteristics of the design, which included visual feature prompts such as shape, colour, and background, with a focus on those motifs which were preferred by the survey participants. Third, a few design styles are assigned to enhance the visual appeal and are inspired by artists, art concepts, designers, and influential domains to significantly impact the resulting visual of everyday products. Next, different structured image compositions and songket motifs or patterns need to be built into everyday items to make sure the visuals are clear and keep the generator and discriminator from going off track. Furthermore, special effects elements are applied to enhance visual dynamics; users should be familiar with specialised terminologies related to specific parts, such as visual effects (VFX), visual output, and supplementary elements that profoundly impact the visual outcome. Finally, there is the colour addition, where the selection of colours plays a pivotal role in making the images livelier, setting the mood, and creating impact in the final visual generated for the everyday designs chosen for this study. The examples of design can be seen in Tables 9a and 9b below. However, there are differences in the prompting command towards the design generated for the designs presented in Table 9b below where the most preferred songket motifs, such as Illicium verum (Bunga lawang/star anise) and Dendrocalamus asper (Pucuk rebung/bamboo) motifs, are inspired and generated directly from the shape of motifs.

Table 9a. *The proposals of innovative cultural with songket motifs using Generative AI Model by the researchers*

1) Homeware/ kitchenware		
		
Kitchen mixer	Coffee maker	Bread toaster
2) Home furnishing/ decorative items		
		
Vase	Dinner ware	Tissue box
3) Stationary/ arts and crafts materials and tools		
		
Diary or organisers	Pen	Laptop bag

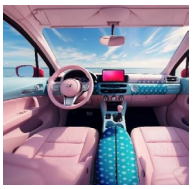
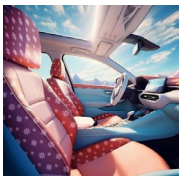
4) Souvenirs or fashion accessories		
		
Men's shoes	Umbrella	Keynobs/ keychains
5) The interior part of transportation design/ Other designs.		
		

Table 9b. *The proposals using Generative AI Model with the application of songket motifs as inspiration for furniture design.*

		
Armchair with Illicium verum (Bunga lawang/ star anise) motif	Armchair with Illicium verum (Bunga lawang/ star anise) motif	Side table with Dendrocalamus asper (Pucuk rebung/ bamboo shoots)
		
Coffee table with Dendrocalamus asper (Pucuk rebung/ bamboo motif	Shelving with Dendrocalamus asper (Pucuk rebung/ bamboo motif	Wardrobe with Dendrocalamus asper (Pucuk rebung/ bamboo motif

5. CONCLUSION AND FUTURE RESEARCH

To sum up, it is necessary to adapt cultural products into designs that are innovative, where the products will serve the purpose of functionality and practicability, have an intrinsic connotation, and have an inherent value. Songket is a Malay traditional textile that shares sophisticated weaving techniques with motifs bioinspired by vast natural elements and surroundings. Nature is always reflected in the design of Malay motifs, and it has always been the source that has been known to offer a wide variety of inspirations. The vast majority of these inspirations are responsible for the growth of songket motifs. Significantly, the results of this study increased the chance of deliberation, pertaining to the familiarity of songket motifs, preferences for motifs, and their potential application in product designs. In terms of the validation process, a survey regarding the potential uses of songket motifs was conducted online by 219 Malaysians who came from diverse backgrounds. The survey provided advice on how to improve the use of songket motifs in designs and promote Malaysian products internationally. In addition, supported information was included in the online survey with the songket motifs, which were categorised as follows: flower or plant motifs, fruit motifs, fauna motifs, cosmic motifs, earth element motifs, and oceanic motifs. The statistical analysis results are tested using the ANOVA test that is available in SPSS, in order to compare the significant differences in the mean value and the non- parametric or unequal distribution of the number of respondents.

Based on the findings, 59.4% of the respondents agree, while only 8.2% disagree with the application of the songket motif into daily-use products. For the familiarity with songket motifs questions, these questions included songket motifs from Table 1. Q3, Q4, Q5, and Q6 yielded contradictory results. Q4 had 46.85% of flower motif votes, the highest proportion overall with 216 counts. The fauna motif followed with 26.03% and 120 counts. But the fruit motif got 0%. Most respondents chose mangosteen, or Tampuk Manggis (in Malay), as a popular songket motif, contradicting the findings. The visual representations were used to determine if respondents recognised the motifs. As for that, it can be concluded that the adaptation of the visual images or Malay translation of the motifs in the question influences the results because the motifs may have been recognised with different names.

Furthermore, songket has global cultural potential, and the respondents agreed that songket motifs should be incorporated into everyday products. Although the preferences of the designs embedded or inspired by songket motifs are not validated in this paper, this could be suggested to be further developed and explored in the future. The designs developed using AI are to propose and show early ideas on how the songket motifs could be embedded into everyday designs. In addition, the utilisation of AI innovation and technology autonomously would give advantages to the design fields for early idea development where the design proposal can be visualised without the need for equipment or machinery, 3D digital software, human intervention, or physical settings, which could also contribute to cost and time savings.

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