

Reimaging indigenous art and craftsmanship through sustainable capsule wardrobe clothing design: A culturally grounded design framework

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Abstract

With the rapid growth and globalization, indigenous knowledge is under mounting pressure to continue its social visibility and economic appropriateness. This paper discusses how Bidayuh cultural identity in Malaysia could be perpetuated by creating a model of a culturally based, sustainable capsule wardrobe as a preservation and adaptive continuity model. A mixed-methods approach was adopted, incorporating cultural documentation, studio-based experimentation, and consumer evaluation. In three stages; cultural grounding, sustainable experimental translation and social validation, the traditional Bidayuh motifs, the meaning of the symbolic colors and principles of craft were systematically rethought into capsule wardrobe clothes by the means of the sustainable techniques. To determine consumer perception and acceptance, a survey of 116 Gen Z respondents was conducted. The findings reveal that indigenous conservation is enhanced when cultural aspects are reinterpreted through wearable, integrated, and sustainability-based systems. The paper presents a framework of Culturally Grounded Sustainable Capsule Design, which places the concept of adaptive reinterpretation and not mere replication at the heart of cultural sustainability in Borneo. The framework provides a transferable framework on how to incorporate the indigenous knowledge in modern sustainable fashion based on ethical underpinning, balanced translation and empirical validation.

Keywords: Indigenous knowledge, Cultural sustainability, Capsule wardrobe design, Design framework, Traditional craftsmanship

Extended Abstract

Introduction: The Bidayuh community of Sarawak possesses a rich cultural heritage, expressed through traditional art, textiles, motifs, colors, and craftsmanship, which remain central to its cultural identity. However, modernization, urban migration, and changing lifestyles have contributed to declining engagement with traditional attire, particularly among younger generations, leading to the underrepresentation of Indigenous heritage in contemporary fashion. At the same time, the global fashion industry is increasingly shaped by sustainability-oriented frameworks such as slow fashion, circular design, and the capsule wardrobe concept, which promote a curated collection of versatile, high-quality garments designed for longevity and mix-and-match functionality, generating multiple outfit combinations and reducing excessive consumption. While existing studies have explored sustainable fashion and the adaptation of traditional elements in contemporary design, limited research has systematically integrated indigenous cultural identity into sustainable capsule wardrobe frameworks. This gap highlights the need for a culturally grounded design framework that positions indigenous identity as an integral component of sustainable fashion practice rather than as purely aesthetic references.

Purpose and scope: This study explores how Bidayuh cultural identity, traditional art, and craftsmanship can be ethically and meaningfully integrated into a contemporary capsule wardrobe through a sustainable fashion design framework. This study seeks to identify the essential characteristics of Bidayuh textiles, motifs, color symbolism, and craftsmanship suitable for design translation while maintaining cultural integrity and sustainability principles. The scope of the research is limited to the design, development, and conceptualization of an ethnic-based capsule wardrobe, focusing on motif adaptation, material and technique selection, and design strategies that support longevity and versatility. It does not address large-scale production or commercialization. Instead, it contributes to a culturally grounded and sustainable

design framework to help designers, educators, and researchers in integrating indigenous heritage into contemporary fashion practice.

Method: This study adopted a mixed-methods approach combining qualitative and quantitative techniques across three phases: a secondary data analysis and experimental design phase, followed by a quantitative survey. The approach was chosen to enable an objective evaluation of user acceptance, perceived functionality, cultural relevance, and alignment with the sustainability of the proposed designs, guided by a culturally grounded sustainable fashion design framework to systematically examine the integration of Bidayuh cultural elements into a contemporary capsule wardrobe. The research was structured into three interconnected phases: cultural understanding and its preservation, experimental design translation, and evaluative validation. These approaches enable the assessment of cultural knowledge, design experimentation, and user feedback within a coherent framework. Secondary data from a prior study were used to ensure cultural accuracy and ethical continuity during conceptual development. An experimental design process involving digital motif translation, material testing, and prototyping was conducted to develop a 10-piece capsule wardrobe that embedded sustainability principles such as longevity, modularity, and versatility. The finalized designs were evaluated through an open survey, with data analyzed using SPSS, enabling empirical validation of the design outcomes and supporting the suitability of the capsule wardrobe as a culturally grounded, sustainability-oriented fashion system.

Findings and conclusion: The experimental phase evaluated the adaptation of Bidayuh cultural and meaningful motifs, and the craftsmanship techniques using four key criteria: motif legibility, cultural recognizability, suitability for repeated wear, and material compatibility for everyday garments. A range of sustainable strategies, including lino printing, applique, patchwork, embroidery, beadwork, cut-out, and cyanotype, were tested on comfort-oriented fabrics such as cotton, linen, cotton-linen blends, and felt to assess their functional and visual performance within a capsule wardrobe. The findings demonstrate that practical cultural preservation in contemporary fashion relies on selective and respectful translation rather than direct replication. Technique suitability was strongly influenced by motif complexity, garment function, and fabric behavior, with lino printing proving most effective for intricate motifs, and applique, patchwork, and embroidery better suited for bold forms. High contrast color application was essential for maintaining symbolic clarity, and these insights directly informed subsequent prototype development, ensuring that cultural identity was preserved through wearable, durable, and sustainable design solutions. Guided by experimental findings, a 10-piece Bidayuh-inspired capsule wardrobe was developed through selective motif adaptation, cohesive color strategies, and sustainable material choices to promote versatility and reduce consumption. Digital visualizations were employed throughout the design process to refine motif placement and silhouette interactions while minimizing material waste. The capsule wardrobe yielded 28 mix-and-match styles over four weeks, demonstrating functional versatility and everyday wearability. Market evaluation involving 116 respondents revealed strong acceptance of the Bidayuh-inspired capsule wardrobe among Gen Z, with particularly high interest. Statistical analysis confirmed a significant relationship between gender, ethnic background, sustainability values, and interest in a capsule wardrobe, indicating broad cross-cultural appeal beyond the Bidayuh community. Reliability analysis demonstrated strong internal consistency of the acceptance scale, supporting the robustness of the findings. Multiple regression analysis showed that belief in successful modern adaptation of the Bidayuh motif was the strongest predictor of acceptance, followed by sustainability-oriented perception and artistic interest, with the model explaining 58% of the variance in acceptance. These results confirm that cultural relevance must be translated into a contemporary, wearable design language to achieve market acceptance, reinforcing the study's theoretical framework, which positions design adaptation as the mediator between cultural identity, sustainability, and consumer uptake. In conclusion, this study validates a culturally grounded sustainable fashion design framework that integrates indigenous identity into capsule wardrobe design. It extends sustainable fashion scholarship by positioning cultural sustainability alongside environmental and functional dimensions. For designers, the findings suggest prioritizing the reinterpretation of contemporary motifs, functional versatility, and clear sustainability narratives when developing indigenous-inspired capsule wardrobes. For educators and industry practitioners, the framework offers a structured approach for embedding cultural adaptation strategies into sustainable fashion education and practice, supporting both cultural continuity and responsible consumption within the contemporary fashion landscape.

Keywords: Indigenous knowledge, Cultural sustainability, Capsule wardrobe design, Design framework, Traditional craftsmanship

INTRODUCTION

One of the most significant native communities of Sarawak is the Bidayuh community, which has a rich cultural heritage manifested in language, craftsmanship, and traditional clothing. Bidayuh art is studied as being rich in material culture with beadwork and patterned weaving being employed as the carriers of the cultural meaning, the representations of nature, spirituality, and identity of the community (Jalil & Alison,

2026). Migration to cities, the change in lifestyle, and the growing generational values and cultures are some of the factors that lead to the gradual separation of younger Bidayuh people with the traditional attire and crafts (Santhar, 2023). The secret of the successful translation of this heritage to modern fashion is that a person must not restrain themselves to aesthetic motivation and further transform it to the moral one. This underrepresentation restricts its potential to contribute to cultural preservation, creative innovation, and community pride. Meanwhile, the minimalistic way of life, slowness in fashion, and sustainable consumption trends are becoming the primary influences of global fashion trends. As one of the fashion styles that promote sustainability values, the capsule wardrobe, with its focus on versatility, durability, and conscious fabric selection, has become a defining trend (Jalil & Shaharuddin, 2019: 1226-1231). Considering the similarity of the value of cultural preservation and sustainable design, there is an urgent need to consider how Bidayuh cultural identity can be strategically incorporated into sustainable design principles. Nonetheless, the research that brings together indigenous identity and sustainability is insufficient, mainly because there are no sustainable fashion design systems that are based on culture. Whether indigenous motifs can be modernized or not is not a question, but how they can be systematically applied to sustainable fashion systems without being diluted culturally or rejected by the market. Thus, the study will examine how cultural identity and sustainability can inform new contemporary capsule wardrobe design that is one of the trendy sustainable practices. In particular, the research is aimed at determining the key attributes of Bidayuh art and craftsmanship that can be best applied to a costume based on ethnicity and at discussing viable ways of incorporating the traditional Bidayuh motifs into modern clothes design. The results of this study will be advantageous to the designers as they provide ethical and systematic method of integrating native aspects in modern fashion design, local communities by promoting cultural images and conservation, and teachers with a cultural reference point of embedded culturally responsive and sustainable fashion design.

LITERATURE REVIEW

Sustainable Capsule Wardrobe Concepts

The fashion industry is among the most wastage and polluting industries in the world that contributes greatly to the environmental degradation with the likes of over production, wastage of textile, carbon emissions. The linear model of fashion, take-make-dispose, of fast fashion makes these problems worse, as clothes are usually used a few times before they are disposed of (Niinimäki et al., 2020: 198). Sustainable fashion is a paradigm developed in opposition to these dilemmas focusing on the environmental responsibility, social ethics, and the creation of long-term value (Jalil, 2022). A number of related theoretical constructs can be used to explain sustainable fashion, and all of them revolve around the challenge of fast fashion. Slow fashion is one of the most influential ones, and the first approach to it is offered by Fletcher (2014), who suggests slowing down the process of production and consumption, focusing on quality, craftsmanship, and emotional longevity, rather than on the trends of quantity. It is true that slow fashion supports physically and aesthetically durable garments, enhancing stronger user-connections and minimizing wastes (Castro-Lopez et al., 2021: 7-9; Fletcher, 2010: 262-265). To supplement slow fashion, the system of circular design and the circular economy that conceptualize fashion systems as a closed loop based on natural cycles is in place. It is determined to remove waste by means of reuse, repair, recycling, and regeneration (Niinimäki et al., 2020: 196-197). The capsule wardrobe has become a clear and feasible approach in this wider sustainable fashion rhetoric that both instantiates these values at both the design and consumption level (Jalil & Shaharuddin, 2019: 1230-1231). Capsule wardrobe is a select set of high-quality clothing, which is versatile and has a long lifespan, as well as providing the flexibility of various combinations and limits the requirement of excessive consumption (Hsiao & Grauman, 2018: 7166-7168; Bardey et al., 2022: 114; Magano et al., 2025: 2). It encourages conscious, low consumption through the adoption of the practice of maximizing the utility of the existing clothes and thus minimizing the need to make new purchases impulsively (Horn et al., 2025: 7-14). Design innovation is essential to the realization of the circular potential of capsule wardrobes. Jalil and Shaharuddin (2019: 1226-1229) used the Cradle-to-Cradle Apparel Design model when developing an eco-capsule wardrobe with the concept of incorporation of multifunctional and convertible garments. There are also social and psychological advantages of building a capsule wardrobe that are revealed through empirical research. The exploratory qualitative study from Bardey et al. (2022: 118-125) that involved participants in a three-week

capsule wardrobe challenge identified that participants felt less stressed and less connected to the changing fashion trends, more aware of conscious consumption, and that the participants found greater self-expression through restrictions. Bang and DeLong (2022: 6-19) investigated everyday creativity in the form of an eight-week capsule wardrobe project that included seven participants. Their results showed that it might result in more creative outfit building, less impulsive buying and better sustainability, including clothes repair and reuse. Such creative products were created out of intrinsic motivation, which supports the values of slow fashion of quality, mindfulness, and voluntary simplicity. The most recent research was conducted by Magano et al. (2025: 8-24) who surveyed 776 consumers and discovered that positive perceptions toward a capsule wardrobe had a strong relationship with socially responsible behavior. The authors emphasize that more systematic interventions, such as designer-led strategies, should be used to enhance the capsule wardrobe strategies. In reaction, modern fashion designers are becoming less and less interested in the production of standalone pieces and more focused on creating systems of compatibility (Jalil, 2022). Although it has been demonstrated that the capsule wardrobe can be viewed as a sustainability approach that is promoted by consumers, there is a relative lack of literature discussing the potential of the capsule wardrobe as a design approach to implementing cultural identity and craftsmanship into the sustainability fashion system.

Integration of Traditional Elements in Contemporary Design

The integration of the traditional ethnic motifs, colors and patterns into modern fashion may be referred to as the altering discourse between the cultural preservation and the innovative thought (Jalil et al., 2024a). Designers are removing and repackaging the traditional elements in the globalized markets to produce globally familiar but culturally specific designs due to globalization, identity formation, conscious consumerism, and differentiation (Skaskiv & Chuprina, 2025; Yao & Inchan, 2024). Rather than imitating the past artefacts, the modern practice is a deconstructive analysis and reinterpretation, combining indigenous craftsmanship with modern materials, updated production processes and modernistic sensibilities (Le et al., 2024; Jalil et al., 2024b). Traditional culture, in this case, serves not as background reference but as the source of design logic and symbolic meaning (Hwui & Jalil, 2025). More recent scholarships focus on adaptive transformation as an important part of continuity in cultures. According to Jalil et al. (2024a; 2024b), preservation is expressed through symbolic meaning, principles of narrative structure, and design rather than the duplication of materials (Jalil, 2024), specifically in SME and contemporary craft. Building on this argument, Jalil (2025: 3-7) and Jalil et al. (2025) show how intangible heritage could be converted into other forms of visual languages using digital and AI-mediated tools without cultural loss. These studies favor a model of culturally based adaptations where the technological mediation and design innovation is concomitant to the preservation of identity in systems that are sustainability oriented. The investigation of Chinese Han cultural aspects proves that simplification, abstraction and re-scaling allow converting the sophisticated traditional motifs into modern-day products without losing symbolic meaning (Yao & Inchan, 2024: 645-648; Jalil et al., 2024b). This is made possible by the use of similar techniques of abstraction and visual condensation to make culturally representative symbols conform to minimalist aesthetics without losing cultural meaning (Han, 2025: 270-271). The process of deformation of the motifs (Kaya & Romanescu, 2022: 198), change of structure and silhouette (Hu, 2022: 28-31), and color recalibration, be it in the direct use of the meaningful traditional palette or using tonal harmonization, are examples of controlled translation, not aesthetic replacement. Ying and Yaacob (2025: 334-337) showed that incorporating Suzhou double-sided embroidery into modern casual clothes not only preserves tradition but also makes it appear more luxurious. These researches prove the fact that traditional elements are adaptive cultural systems, but not fixed artefacts (Jalil & Alison, 2026). Nevertheless, despite a record of fruitful motif reinterpretation across different cultural settings, there are two essential constraints. To start with, a significant portion of the research to date views ethnic integration as an aesthetic intervention rather than as cultural identity incorporated into a formal sustainability framework. Whereas sustainable fashion studies focus on material efficiency, circular systems and consumer behavior (Fletcher, 2010: 262-265; Niinimäki et al., 2020: 195-198), they mainly focus on environmental and functional aspects, with cultural sustainability relatively under-theorized. Indigenous people in Borneo, especially Bidayuh community, are still underrepresented in empirically validated research. As a result, integrative models that can bring together cultural grounding, sustainable material strategies, calibrated design translation, and consumer validation into a cohesive framework are severely lacking.

This study formulates the concept of cultural sustainability as a dynamic process where the indigenous identity is maintained due to structural reinterpretation and not replication. Figure 1 shows the proposed Culturally Grounded Sustainable Capsule Design Framework, which combines 3 connected areas: cultural grounding which is supported by previous research (Skaskiv & Chuprina, 2025; Han, 2025; Yao & Inchan, 2024; Le et al., 2024; Jalil et al., 2024b), sustainable design translation, and market validation. It is based on cultural grounding, which involves symbolic motifs, color meanings and artisan craft traditions based on Bidayuh heritage. These aspects inform the second area, sustainable design translation, in which conventional knowledge is experimentally redefined through environmentally efficient methods and capsule wardrobe values (Bang & DeLong, 2022; Jalil & Shaharuddin, 2019). This structure revolves around the degree of design translation, as an idea that is conceptualized as a moderating element that balances the stress between cultural authenticity and wearability of the time. Market validation determines the perception and acceptability of the consumer (Magano et al., 2025) to make adaptive reinterpretation an economic and social concept. The framework that forms cultural identity within a sustainability-based system of design establishes a paradigm in which indigenous knowledge is implemented as cultural memory and current design capital.

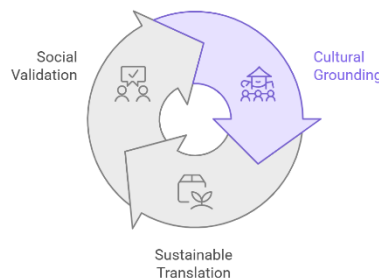


Figure 1. Culturally Grounded Sustainable Capsule Design Framework (CGSCD Framework)

METHOD

This study adopted a mixed-methods approach. This work can be applied to a proposed culturally-based sustainable fashion design system, where the study is organized into three interdependent stages, i.e., cultural knowledge or identification adjustment, experimental transfer of sustainable clothing design, and the acceptance/evaluative validation of the market. This study adopted a mixed-methods approach combining qualitative and quantitative techniques across three phases: a secondary data analysis and experimental design phase, followed by a quantitative survey. This study received ethical approval from the Ethics Committee of the Faculty of Applied and Creative Arts, Universiti Malaysia Sarawak. The research procedures were conducted in accordance with the ethical guidelines and regulations of Universiti Malaysia Sarawak and followed internationally accepted standards for research involving human participants. Ethics approval for this study was obtained from the UNIMAS Human Research Ethics Committee (Non-Medical) during Meeting No. 04/2025, held on 19 May 2025.

Cultural Grounding and Preservation

To begin with, at the first stage, which is the step of developing and imagining the cultural identity, and a level of cultural preservation, this research paper relies on the secondary data by referring to the previously published and peer-reviewed results as a means of informing its conceptual formation to avoid misrepresentation and commodification of the motifs, symbols, and meanings. In addition, the idea of transferring of traditional elements to modern forms without corrupting culture is paramount in cultural studies as well as being instrumental in the intergenerational transmission of indigenous knowledge. In this study, the cultural meanings, identity adaptations, and known classifications of the important Bidayuh motifs were systematically laid out and confirmed by Jalil and Alison (2026). The authors began with the collection of secondary data that included semi-structured interviews with Bidayuh artisans and the community leaders, which they published in a report (Jalil & Eleen, 2026). This ethnographic data was supported by a visual analysis of Bidayuh artifacts in order to identify and codify the symbolic value of the most significant biomorphic motifs and patterns. Since these cultural data points have already been validated by the essential means of ethnographic research and

academic analysis, the current research does not aim to repeat or redefine the same cultural records. Rather, the authenticated quantitative secondary data are strategically used as a credible source of knowledge to help build a sustainable framework of a culturally based design of a capsule wardrobe. Such methodological approach helps to increase the rigor of research, prevents the repetitions of the same information, provides the continuity of an ethical character, and permits contemporary study to make the recent theoretical and design-oriented developments beyond the area of the initial documentation.

Sustainable Experimental Translation

There was an experimental procedure in the desire to integrate the Bidayuh cultural aspects into a modern concept of the capsule wardrobe. This stage aims at taking Bidayuh patterns into the modern capsule wardrobe products that can be worn on a daily basis. During observation, photographs of motifs were made of material culture of Bidayuh (Jalil & Alison, 2026). The creation of timeless objects, aimed at the reduction of excessive consumption, the experimentation with the old patterns, in accordance with the environmentally friendly procedures, the materials that do not have negative effects or cause harm, or that are made locally are of great importance within this stage. Motifs that were ritual related and cultural taboos were left out. This contributed to the fact that the process of the translation is culturally respectful and suitable in the context of modern fashion. These motifs were then translated into wearable applications by the experiment phase using the vectorized motifs to facilitate motif translation which allowed translation of the motifs to different surface designs and translation methods. To create a baseline of the silhouettes and measure the accuracy of construction, prototypes of 10 pieces of a capsule wardrobe were developed. The principles of sustainability were introduced at the design phase, which included the adoption of timeless silhouettes, modular and mix-and-match styling, and experimenting with limited materials in accordance with the capsule wardrobe principles that put more emphasis on longevity and less on consumption.

Social and Market Validation

At the last phase, the user assessment was performed as a part of the entire design set-up. The purpose of this evaluation was to confirm the design in question as effective with respect to user acceptance, perceived functionality, cultural relevance and sustainability alignment. This step enabled the capsule wardrobe to remain only a conceptual or aesthetic result, but a design system created by the user, which promoted sustainability. An open survey sampling methodology (non-probability) was used, and anyone (not gender-specific) could participate in the study. This open voice strategy allowed gathering a variety of opinions about the suggested capsule wardrobe designs and, at the same time, it remained topical with the fashion customers of the time. In spite of the fact that the capsule wardrobe was initially designed with Gen Z users in mind, there was no specific age limitation in terms of responses, which allowed expanding the perception of the wearability, cultural relevance, and sustainability values. But among 189 respondents, 116 were found to measure validity between Gen Z, who are aged between 19 and 27 years. The information was collected using Google Forms in December 2025 to capture the user feedback of the respondents in Malaysia. The data were gathered and analyzed with the help of SPSS to measure the acceptance of users, perceived functionality, cultural relevance, and compatibility with sustainability of the Bidayuh-inspired capsule wardrobe.

FINDINGS AND RESULTS

Cultural Identity Adaptation and Motif Documentation
























The experimental procedures were tested in terms of motif legibility, cultural recognizability, the ability to repeat the wear, and material compatibility to daily garments. Table 1 captures the experimentation of the motif that was completed in this stage, material experimentation, modification of the motif, silhouette experimentation, and color experimentation which has been captured in a sequence of experimental photographs created by the researchers. This experimental procedure allowed choosing the best method of motif development through the comparison of the advantages and weaknesses of each method, which is consistent with the objectives of producing culturally-based but useful pieces of the capsule wardrobe. Table 1 has shown that lino printing was the most effective method in the intricate and multi-element motif, whereas applique, patchwork and embroidery was the best method in bold and structurally defined motives. In all the

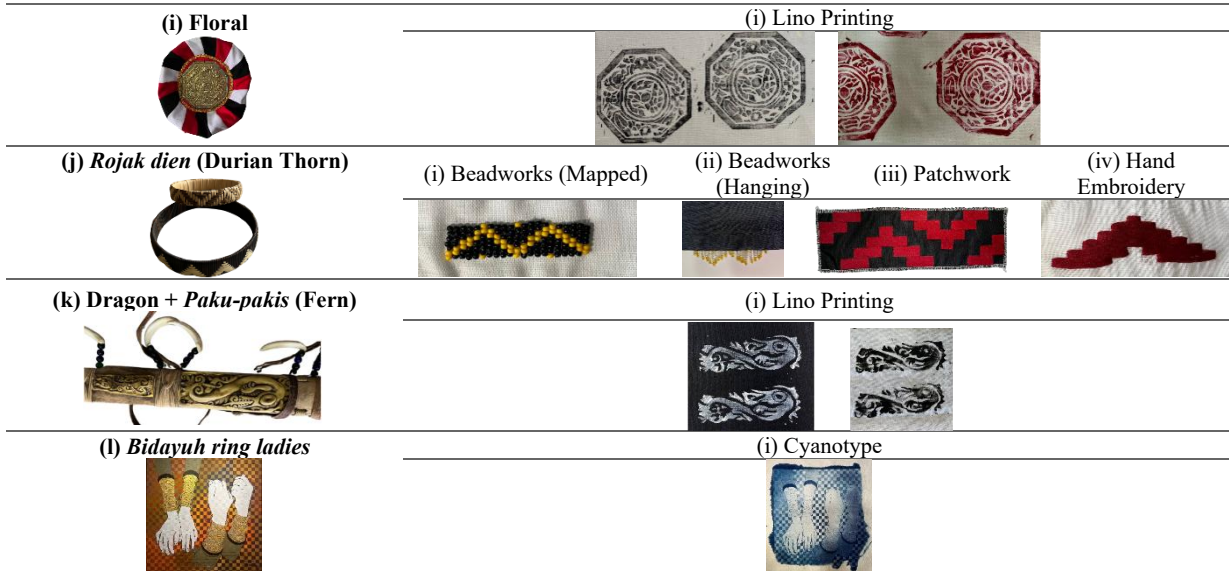
experiments of lino printing, the pairings of colors of high contrast were necessary to maintain the legibility of the motifs and the symbolic power. The results of these findings were the direct input to the methods of selection and the material used in the next stage of the development of the prototype of the capsule wardrobe design. In addition to technical optimization, these experimental results operationalize the principle of calibrated design translation in that they show that the complexity of motifs, color contrast and material behavior can have a direct effect on symbolic clarity. This step guarantees that cultural recognizability remains intact but, at the same time, the motifs are adjusted to suit modern-day wear by performing a systematic test of technique-motif compatibility. The results, consequently, form the structural base of culturally based sustainability to avoid ornamental excavation and strengthen symbolic autonomy in the capsule system.

Sustainable capsule wardrobe, material experimentation, and design trials

Based on the experimental results on the motif translation of Bidayuh (Table 1), a 10-piece capsule wardrobe was created through the selective incorporation of culturally relevant motifs confirmed by Jalil and Alison (2026), sustainable materials, and unified color schemes. As shown in Figure 2, each item represents contextual communication between the Bidayuh cultural symbolism, modern wearability and eco-friendly design practice.

Table 1. Translation of selected Bidayuh motifs into contemporary designs using sustainable techniques

Original Bidayuh Motif (Jalil & Alison, 2026)	Translated Design - Applied Technique(s)		
	(i) Applique	(ii) Patchwork	(iii) Beadworks
(a) <i>Boton Manuk Puni</i> (Pigeon's Eye) 			
(b) <i>Tiger Head</i> 	(i) Hand Embroidery (Button form) 	(ii) Lino Printing 	
(c) <i>Ikan Koi</i> 	(i) Lino Printing 		
(d) <i>Pucuk rebung</i> (Bamboo Shoot) 	(i) Cut-out 	(ii) Hand Embroidery 	(iii) Lino Printing 
(e) <i>Paku-pakis</i> (Fern) 	(i) Hand Embroidery 	(ii) Lino Printing 	
(f) <i>Bamboo Leaf</i> 	(i) Machine Embroidery 	(ii) Lino Printing 	
(g) <i>Paddy</i> 	(i) Lino Printing 		
(h) <i>Daun sireh</i> (Piper betel) 	(i) Lino Printing 		



Notes:

- Original motifs are adapted from Jalil & Alison (2026), excluding culturally sensitive or ritual-related motifs.
- Sustainable techniques include low-waste and craft-based approaches such as appliqué, embroidery, lino printing, and cyanotype.
- “Translated Design” refers to the prototype application within contemporary capsule wardrobe development.



Figure 2. A ten-piece Bidayuh-inspired capsule wardrobe collection

Boton manuk puni (Table 1-a): The motif was experimented with using applique, patchwork, and beadwork techniques. The use of applique, patchwork, and beadwork consistently produced positive results. Applique (Table 1-a-i) and patchwork (Table 1-a-ii) made with felt consistently yielded positive results due to their non-fraying edges, which allowed the motifs to retain a clean, well-defined form. These techniques demonstrated a strong structural stability and visual appeal, making them suitable for repeated wear in daily garments. Beadwork enhanced the motif’s tactile quality, reinforcing its cultural prominence and decorative emphasis.

Tiger head motif (Table 1-b): The motif was explored through hand embroidery and lino printing. Hand embroidery (Table 1-b-i) produced a detailed and dimensional outcome, particularly when shaped into button forms, highlighting the motif's expressive qualities. Lino printing (Table 1-b-ii) revealed that color contrast played a critical role in motif visibility. The black-on-white linen produced the strongest visual contrast. The red-on-white also achieved acceptable clarity. In comparison, yellow-on-red linen resulted in reduced visual impact, suggesting limitations in color pairing. A more successful outcome was observed with a yellow-on-black and black-on-red, which provided stronger visual separation between motif and background, allowing the form to remain prominent.

Ikan koi (Table 1-c): Due to the intricacy of the motif, lino printing (Table 1-c-i) was the only technique tested. Linen fabric was used during the experimentation. Yellow-on-black printing maintained acceptable clarity despite its complexity. In contrast, yellow-on-white and yellow-on-red combinations reduced contrast, leading to a loss of definition in finer details and a decrease in visual impact.

Pucuk rebung (Table 1-d): The motif was tested using cut-out, hand embroidery, and lino printing techniques. Cut-out technique (Table 1-d-i) employing black cotton-linen paired with red felt produced a strong visual contrast and sharp motif definition. Hand embroidery (Table 1-d-ii) using red DMC thread on cotton fabric yielded refined results, reinforcing the motif's geometric clarity. Lino printing in black on white cotton further confirmed the technique's effectiveness for this motif.

Paku-pakis (Table 1-e): The motif showed excellent adaptability across techniques. Hand embroidery (Table 1-e-i) produced highly refined results, enhancing the motif's organic curves. Lino printing (Table 1-e-ii) was also effective, particularly in white-on-black and black-on-white linen combinations. However, the black-on-red combination reduced contrast, making the motif appear less distinct and therefore less suitable for precise representation.

Bamboo leaf (Table 1-f): This motif was explored through machine embroidery and lino printing, both of which were effective. The machine embroidery (Table 1-f-i) process, using interfacing cut to motif shape and ironed onto organza before outlining, created a lightweight yet defined appearance, suitable for layering and semi-transparent garments. Lino printing (Table 1-f-ii) further reinforced motif clarity, with both white-on-black and black-on-white on linen fabric applications yielding strong visual results.

Paddy motif (Table 1-g): The motif was tested exclusively through lino cutting (Table 1-g-i). Black-on-white linen produced the most evident contrast and the most legible outcome. In comparison, black-on-red and yellow-on-black combinations resulted in reduced visual impact, while yellow-on-red produced only moderate clarity due to minimal tonal contrast.

Daun sireh motif (Table 1-h): Given its complexity, the motif was explored solely through lino cutting (Table 1-g-i). Black-on-white and red-on-white combinations effectively captured the motif's intricate forms without visual clutter. Black-on-white and red-on-white effectively captured the motif's intricate forms without visual clutter, producing a clear, contrasting outcome. Yellow-on-black and yellow-on-red yielded an acceptable, but slightly subdued, outcome. However, the red-on-black combination failed to achieve sufficient visibility, underscoring the importance of high-contrast color pairings.

Floral motif (Table 1-i): The motif was developed using linocut printing (Table 1-i-i). Both black-on-white and red-on-white linen produced a clear, visually balanced result that enhanced the motif's elegance.

Rojak dien (Table 1-j): This motif was explored through patchwork, beadwork, and embroidery. Patchwork (Table 1-j-i) applications using black linen as the base, paired with felt, yielded structurally strong, visually coherent results. Beadworks experiment produced varied results. Bead mapping (Table 1-j-ii) directly onto fabric yielded excellent clarity and stability, whereas hanging-bead (Table 1-j-iii) applications were visually acceptable but less controlled. Hand embroidery (Table 1-j-iv) using red DMC thread on white cotton fabric further demonstrated the motif adaptability and suitability for garment surfaces.

Dragon and paku-pakis (Table 1-k): The combined motif was successfully translated using lino printing (Table 1-k-i). White-on-black and black-on-white combinations on linen yielded strong contrast and visual clarity, indicating that lino printing is particularly well-suited to these complex, multi-element compositions.

Bidayuh art (Table 1-l): The artwork was explored using the cyanotype technique. When applied to cotton fabric, the process produced a clear and stable image with strong visual definition. However, results on linen were less successful, suggesting that cotton is a more suitable substrate for cyanotype applications. These experimental outcomes confirm that technique selection must be guided by motif complexity, intended garment function, and material behavior. Lino printing emerged as the most versatile technique for complex motifs, while appliqué, patchwork, and embroidery were better suited for bold, structurally defined motifs. Overall, the results indicate that high-contrast color pairings are crucial in lino printing to preserve clarity and symbolic strength when translating Bidayuh visual elements into contemporary textile applications. These findings directly informed the selection of techniques and materials for subsequent prototype development in the capsule wardrobe design phase.

The experimental outcomes indicate that technique selection must be guided by motif complexity, intended garment function, and material behavior. Lino printing emerged as the most versatile technique for intricate and multi-element motifs, while applique, patchwork, and embroidery were most suitable for bold, structurally defined motifs. Across all lino printing experiments, high-contrast color pairings were essential for preserving motif legibility and symbolic strength. These findings directly informed the selection techniques and materials for the subsequent prototype development of the capsule wardrobe design phase.

Building on the experimental findings on Bidayuh motif translation (Table 1), a 10-piece capsule wardrobe was developed by selectively integrating culturally significant motifs, sustainable materials, and cohesive color strategies. The final designs (Figure 2) comprise a top, vest, jacket, blouse, two pairs of wide-leg pants, a wrap skirt, two dresses, and a bag, enabling multiple styling configurations while maintaining a coherent Bidayuh-inspired visual identity. Not all experimentally explored motifs were applied in the outcomes; selective adaptation was intentionally employed to prevent visual saturation and to preserve balance, cultural clarity, and garment versatility within the capsule system. All design developments were digitally visualized before physical execution, enabling iterative refinement of motif placement, proportion, and composition while minimizing material waste, thereby supporting sustainability objectives. Each garment reflects a contextual dialogue between Bidayuh cultural symbolism, contemporary wearability, and responsible design practice. The tank top uses white cotton in a neutral ground to receive the *Bidayuh ring ladies* motif of the cyanotype (Table 1-k-vi), which foregrounds the artistic expression in a daily figure. Based on the male Bidayuh clothing, a sleeveless denim vest incorporates the *pucuk rebung* (Table 1-d-i) and *paku-pakis* (Table 1-e-iv) patterns with white embroidery, which strengthens the cultural theme through the use of organized layering. Further examples of selective positioning of motifs are in outerwear and top garments. One of them is a black linen jacket with *rojak dien* (Table 1-i-ii), which is red patchwork on the cuffs, referring to its historical position in the functional form. The sleeved blouse uses Bidayuh color symbolism, red, white, and black, as the cuffs and the paddy motif (Table 1-g-v) on the white central stripe is done in black lino print. Two wide-leg trousers take the motif experimentation to a next level with patchwork and cut-out designs, with *boton manuk puni* (Table 1-a-i) and *pucuk rebung* (Table 1-d-i), respectively, balancing between durability and visual differentiation. The skirts and dresses are more based on the traditional Bidayuh costume sensibilities. The midi wrap is a wrap skirt that is vertically striped, red and white (on the wrap edge), and *pucuk rebung* (Table 1-d-v) is placed using lino printing. The strapless red linen dress in a similar manner makes *pucuk rebung* (Table 1-d-iv) to be placed at the bottom part to give cultural emphasis and a detachable two-part dress outfit to incorporate paddy motifs (Table 1-g-v) and *rojak dien* beadwork (Table 1-i-iii). Finally, a red canvas belt bag is completed with the capsule, *paku-pakis* (Table 1-e-iv) performed in white embroidery, and with the help of which the motifs continue to unite the accessories. As shown in Figure 3, a total of 28 different styles were developed through the combination of outfits proposed during Weeks 1 to 4. Such combinations used in Figure 3 indicate how versatile and mix-and-match the capsule wardrobe can be. These glances show how the culturally inspired patterns enable the visual identity of the clothes without concealing their contemporary functionalism.

The development of the 10-piece capsule wardrobe demonstrates how selected motifs and experimental techniques can be systematically translated into contemporary garments while maintaining cultural coherence and functional versatility. The selective application of motifs, combined with consistent color strategies and adaptable silhouette, supports the capsule wardrobe's role as a sustainability-driven design system. Following

the design development in Figure 2, a total of 28 unique styles were created by combining outfits suggested across Weeks 1 to 4. These combinations, shown in Figure 3, demonstrate the versatility and mix-and-match potential of the capsule wardrobe. These looks illustrate how culturally inspired motifs enhance the garments' visual identity without overpowering their modern functionality. This styling exploration also serves to validate the practicality of incorporating traditional Bidayuh elements into casual everyday wear for younger audiences. The capsule wardrobe will be further evaluated to assess user perception, acceptance, and overall wearability.

Evaluation and market acceptance

116 respondents were used to carry out the survey. The majority of respondents as indicated in Table 2 fell within the 22-24 years age. The target population was mainly female (69.00%), as it is within the aim of this research. The target of the study is not to address Bidayuh Gen Z; it is the issue of cultural maintenance in the younger generation. This distribution will offer a good foundation in the analysis of how the Bidayuh-inspired clothing is perceived by the target culture as well as other ethnic groups. In terms of the preference of styling, the most preferred style was subtle and minimalistic followed by modernized. This implies that modernizing the designs is preferable to traditional designs. The concept of a particular product has a positive reception to the point of being overwhelming. When questioned whether they would be interested in clothing that is inspired by the Bidayuh art and cultural aspects 79.3% of the respondents responded in the affirmative, with only 3.4% responding in the negative. This means that there is good market viability. This establishes the fact that capsule wardrobes cease to be viewed as abstract ideas of sustainability but as practical lifestyle strategies that may be associated with use-oriented models of sustainable fashion.



Figure 3. Styling combinations – Bidayuh capsule clothing wardrobe

A Chi-Square (χ^2) test was conducted to find out whether gender has any effect on the interest in having a capsule wardrobe which is a big relationship ($\chi^2 = 17.49$, $p = 0.002$). Connection between ethnic and interest towards Bidayuh-inspired clothing was very much significant ($\chi^2 = 82.16$, $p < 0.001$). As anticipated, 100 percent of Bidayuh respondents showed interest, but other ethnic groups were also found to have a high interest indicating that the appeal is not limited to certain ethnic groups. The importance attached to

sustainability by the user and the desire to pay a premium price on sustainability were found to have a significant relationship ($\chi^2 = 12.93, p = 0.044$).

Table 2. Demographic profile of respondents (N=116)

Demographic Variable	Category	Frequency (n)	Percentage (%)
Age	19-21	32	27.6
	22-24	56	48.3
	25-27	22	19.0
	28 and above	6	5.2
Gender	Female	80	69.0
	Male	28	24.1
	Prefer not to say	8	6.9
Ethnicity	Bidayuh	28	24.1
	Chinese	24	20.7
	Malay	16	13.8
	Iban	14	12.1
	Melanau	10	8.6
	Others (Bajau, Indian, etc.)	24	20.7

The average points in Table 3 demonstrate a positive rating of the concept of the capsule wardrobe and adaptation of the Bidayuh cultural elements to modern fashion. Preference towards fewer, versatile garments (M = 4.21) has the highest mean score, which demonstrates the strong adherence of the respondents to the principles of minimalist and sustainable fashion. The Reliability Analysis (Cronbach's $\alpha = 0.86$) shows a good internal consistency, which means that the items are useful in measuring a single construct associated with acceptance of a Bidayuh-inspired capsule wardrobe.

Table 3. Descriptive statistics of key constructs (N = 116)

No.	Variable	Mean	SD
V1	A capsule wardrobe improves daily outfit planning	3.86	0.82
V2	Preference for owning fewer mix-and-match clothes	4.21	0.89
V3	Interest in wearing Bidayuh-inspired clothing	3.78	0.86
V4	Belief that cultural motifs can be adapted into modern clothing	4.13	0.74
V5	Suitability of Bidayuh-inspired capsule wardrobe for daily lifestyle	3.64	0.78

Further, the key variables were all positively and significantly related to each other, which suggests that the sustainability-oriented clothing behavior is strongly interrelated with the cultural interest and perceived suitability of the lifestyle (Table 4). Hence, the ideation of successfully adapting Bidayuh to the modern world was associated with cultural interest ($r = 0.66$) and lifestyle suitability ($r = 0.61$).

Table 4. Pearson correlation matrix ($p < 0.01$)

Variables	V1	V2	V3	V4	V5
V1 Capsule wardrobe improves planning	1				
V2 Preference for fewer clothes	0.48**	1			
V3 Interest in Bidayuh-inspired clothing	0.41**	0.39**	1		
V4 Belief in the modern adaptation of motifs	0.44**	0.36**	0.66**	1	
V5 Lifestyle suitability	0.52**	0.43**	0.55**	0.61**	1

To test the concept, a Multiple Regression Analysis was done as demonstrated in Table 5. The regression explains 58% of the variation in acceptance of Bidayuh-inspired capsule wardrobe. Belief in the successful modern adaptation of cultural motifs was the most significant predictor ($\beta = 0.41$), then there were the perceptions connected to sustainability and artistic interest. This implies that culture relevancy has to be reduced into the modern design language to guarantee daily wearability. The findings validate the mediation effect of the degree of design translation as the mediating variables between consumer acceptance and cultural identity in the context of sustainable systems. Results obtained from experimental calibration, capsule system development and consumer validation give empirical evidence to the proposed Framework. The cultural grounds created symbolic clarity; sustainable translation meant functional and material sustainability, and

market validation consumer acceptance in the case where the perception of successful adaptive reinterpretation was made.

Table 5. Multiple regression analysis predicting acceptance of Bidayuh-inspired capsule wardrobe ($p < 0.001$)

Predictor	β	t	Sig.
Sustainability-oriented capsule wardrobe perception (V1)	0.29	3.21	0.002
Preference for fewer clothes (V2)	0.18	2.07	0.041
Interest in Bidayuh-inspired clothing (V3)	0.24	2.88	0.005
Belief in modern adaptation of cultural motifs (V4)	0.41	4.96	< 0.001

DISCUSSION

As a subset of the greater sustainability discursive of Borneo, in which the processes of speedy development, the climate pressures, and the globalization processes are all the more violent in terms of the indigenous visibility, the research makes it a design-oriented strategy to preserve the traditional knowledge. The paradigm does not introduce indigenous craftsmanship as a flexible resource that can adapt to the economic and lifestyle systems of modernity, instead of portraying the act of preservation as one of resistance to modernity. The study contributes to the paradigm of regional resilience in which cultural knowledge is not yet out of sight in the social, economic and ecological domains. It directly addresses the calls to preserve traditional knowledge in Borneo by showing how design innovation can serve as one way of preserving cultural continuity through change.

Grounding and Adaptation of Ethics and Culture

The research provided a cultural background through the systematic identification of Bidayuh motifs, symbolic color meanings, material traditions, and contextual meanings. The design process did not think of motifs as decorative resources but rather placed them as identity bearers as part of the environmental and social storylines. This strengthens the idea that the indigenous motif must undergo an ethical consultation and contextual sensitivity before adaptation. The results also indicate that the preservation in modern design should be dynamic. The fact that most of the respondents were sure that the modern adaptation of Bidayuh motifs is successful points to the fact that heritage can be viewed as a living system and not a fixed object. The framework helps ensure the continuity of culture outside the ceremony by integrating motifs into everyday garments, enhancing the intergenerational presence and applicability of indigenous identity in Borneo.

Experimental Translation Sustainability

The idea of the level of design translation became a very important tool of connecting the authenticity of cultural to wearability and sustainability. The results of experiments showed that the complexity of motifs, fabric behavior, and color contrast have a significant impact on translation results. Lino printing was most successful with intricate patterns, embroidery and patchwork with structurally demarcated shapes. Notably, translation quality is a mediator of the correlation between culture grounded and consumer acceptance. The integrity of culture did not provide usability, but instead selective re-interpretation provided comfort, longevity and repeated use. The maintainability viewpoint implied that halting heavy embellishment in favor of lightweight, all-purpose methods decreased and promoted the principles of the capsule wardrobes of durability, mixability, and consumption minimalism. Hence, it was not an aesthetic change, but the measured change that created a balance between recognizability and functional efficiency.

Social Justification and Market Acceptance

The quantitative results are empirical confirmation of the third pillar of the framework. The sustainability-oriented perception was positively correlated with the lifestyle suitability, moderately and significantly predicted the acceptance. Minimalist ownership preferences also played a positive, albeit smaller, role in the same. The most interesting finding was that belief in the successful modern adaptation of Bidayuh motifs was the most significant predictor of acceptance. This implies that sustainability and cultural interest can only be adopted as a consumer when incorporated into modern and wearable design solutions. The importance of this variable means that design implementation mediates two values, cultural and sustainability, and turns them into functionality compatibility with lifestyle. These results support the theory of slow fashion but apply it in

the case of indigenous regions, where sustainability acts not as an environmental responsibility but as a justification mechanism to justify the fact of everyday incorporation of traditional knowledge.

Theoretical, Practical and Methodological Contribution

The research develops a sustainable theory by making cultural sustainability a structural aspect as opposed to a fringe aesthetic one. The study contributes to the research design-based inquiry through the incorporation of the cultural documentation, experimental garment development, and quantitative consumer validation in the same empirical framework. However, in extending this framework for broader commercial application, it is essential to ensure the protection of the Bidayuh community's intellectual and cultural rights. Future implementation should prioritize ethical collaboration, proper acknowledgment, and equitable benefit-sharing mechanisms to support the community's socio-cultural and economic well-being. This triangulated method overcomes the conceptual arguments of heritage integration by affixing to a statistically confirmed methodology. The suggested capsule wardrobe system is a feasible structure in terms of turning Bidayuh indigenous knowledge to a sustainable economic resource to directly meet the dual issues of cultural erosion and economic insecurity. The strategy is part of the Malaysian creative economy by enabling native women entrepreneurs and using a cultural resource, which is not fully exploited, to develop sustainably. With Bidayuh culture identity centered on sustainable capsule system, the research paper can also be seen as a part of an emerging sustainability discourse on Borneo, as it illustrates how indigenous knowledge could be turned into an adaptive commodity, as part of a modern design economy, and not merely a static preservation discourse.

CONCLUSION

This paper has illustrated how Bidayuh cultural identity can be instituted into modern sustainable fashion using a capsule wardrobe strategy leading to formulating and approving a Culturally Grounded Sustainable Capsule Design Framework. The research is carried out through systematic three-process research method, i.e. cultural backgrounding, experiment translation and user validation of the research, and this validates that native integration in fashion entails more than aesthetic referencing. It demands moral cultural consultation, re-interpretation in moderation as well as consistency with sustainable consumption regimes. The results define the preservation within the modern environment as a dynamic interpretation, which does not imply the stagnation of the reproduction of the heritage forms but promotes the preservation of recognizability and improvement of functionality, durability, and practicality. The study fills the gap between preservation, innovation, and responsible consumption by framing the idea of a capsule wardrobe as a means of maintaining a culture. Although confined to one indigenous setting, as well as pilot-scale research, the framework provides a conceptual framework transferable to designers, educators and industry practitioners interested in integrating indigenous knowledge into the system of sustainable fashion.

Authors' Contributions

The authors contributed equally to the study. Marzie Hatef Jalil is responsible for conceptualization, methodology, data curation, validation, resources, formal analysis, writing-original draft, writing-review & editing. Jane Eleen Alison is responsible for Conceptualization, methodology, investigation, visualization, resources, writing-original draft.

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Competing Interests

There is no potential conflict of interest.

Ethics Committee Declaration

Ethics committee approval dated 21/05/2025 and numbered UNIMAS/NC-20.02/06-04/01 (54) was obtained by University Malaysia Sarawak Human Research Ethics Committee (Non-Medical).

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