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Preserving Heritage through Participatory Design Process: Sustainable packaging for traditional orang asli game kerchang

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Abstract

Kerchang, a traditional Orang Asli puzzle, faces declining continuity due to modernization and limited cultural transmission. This study explores how sustainable packaging, developed through participatory design and design thinking, can support cultural preservation while addressing issues of misrepresentation and minimal youth engagement. Orang Asli representatives and museum practitioners co-created eco-friendly packaging incorporating natural motifs, recyclable materials, and a QR-linked instructional feature. Findings show that participatory co-design enhances cultural visibility, community ownership, and product value. Challenges remain in protecting Indigenous intellectual property. The study advocates Indigenous-led design collaborations to strengthen ethical cultural industries and sustainable heritage preservation.

Keywords: Orang Asli ; Sustainable packaging ; Cultural integrity ; Participatory Design

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1.0 Introduction

The Orang Asli, the Indigenous peoples of Peninsular Malaysia, are custodians of a rich cultural heritage encompassing oral traditions, ecological knowledge, crafts, and traditional games. These games, passed down through generations, are not merely recreational but vital expressions of communal knowledge, social values, and Indigenous worldviews (Ismail et al., 2022). They serve as informal tools that cultivate strategic thinking, motor skills, and cultural identity. However, modernization and digital consumerism increasingly threaten their continuity, particularly among younger generations (Ramli & Ahmad, 2021).

As Malaysia embraces a more inclusive, sustainability-oriented economy, there is growing recognition of Indigenous contributions to the creative and cultural industries (UNESCO, 2022). Yet, commercial integration of cultural products must be community-led and ethically grounded. Without genuine collaboration, there is a risk of cultural commodification and misrepresentation (Langton & Teo, 2021; Nakata et al., 2021).

This paper introduces a sustainable packaging prototype for *Kerchang*, a traditional Orang Asli game, as a case study in design-led cultural preservation. This study aims to develop a sustainable, culturally grounded packaging solution for the Orang Asli traditional game Kerchang through the application of participatory design and design thinking methodologies. Objectives of the study are (1) to

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co-design sustainable packaging concepts with Orang Asli representatives and museum practitioners and (2) to develop and evaluate a packaging prototype that integrates ecological materials, cultural motifs, and educational features such as QR-based instructional content. Rooted in participatory design and Indigenous research paradigms, the process highlights how packaging can embody cultural values through traditional motifs, storytelling, and the use of ecologically and culturally appropriate materials (Martin & Blundell, 2022; Wilson, 2022). By aligning sustainable design principles with Indigenous knowledge systems, the project promotes cultural resilience, environmental responsibility, and inclusive economic participation (Yusof & Halim, 2023; Peters & Lee, 2023). Here, packaging becomes more than protection, it is a cultural interface, enabling intergenerational learning, storytelling, and ethical market engagement.

2.0 Literature Review

Globally, Indigenous communities have long faced challenges in product and packaging design, often experiencing misrepresentation and cultural appropriation. Motifs are frequently extracted without consent, stripped of meaning, and repurposed for commercial appeal (Nakata et al., 2021), flattening complex narratives and eroding cultural significance. In response, scholars advocate decolonial design frameworks that prioritize Indigenous agency. Nakata et al. (2021) and Martin and Blundell (2022) emphasize co-creation and cultural sovereignty through Indigenous-led approaches. This requires an Indigenous relational worldview, where identity is deeply connected to land, ancestors, and collective well-being (Wilson, 2022). In this context, packaging is not merely functional, it embodies cultural responsibility. Peters and Lee (2023) stress that involving Indigenous communities across the design process safeguards cultural integrity and fosters intergenerational knowledge transfer. Through ethical co-design, communities retain narrative control and gain economic value. Thoughtfully developed packaging thus becomes a medium for storytelling, cultural education, and community resilience.

2.1 Traditional Games as Cultural Artefacts

Traditional games are intangible cultural artefacts that carry values, wisdom, and social structures. In Malaysia, games such as gasing, batu seremban, and congkak preserve Indigenous knowledge and support intergenerational learning (Ismail et al., 2022). They foster cognitive, emotional, and social development while reinforcing respect and cooperation (Ramli & Ahmad, 2021). However, digital entertainment threatens their continuity. Cultural innovation is needed, and sustainable packaging can visually communicate their significance (Yusof & Halim, 2023). Kerchang, played by the Orang Asli, can be revitalized for education, tourism, and cultural exchange.

2.2 Sustainable Packaging Principles

Sustainable packaging now encompasses environmental, social, and cultural dimensions. It extends beyond waste reduction to include ethical sourcing, life-cycle assessment, and community participation (Zhao et al., 2021; Ng & Goh, 2022). In Indigenous contexts, sustainability must reflect ecological knowledge and cultural values (Tan et al., 2023). Packaging becomes a tool for both environmental stewardship and cultural preservation.

2.3 Cultural Economy and Indigenous Game Packaging

Indigenous communities are often excluded from mainstream economies due to limited market access and intellectual property protection. Yet, the cultural economy offers inclusive development pathways. UNESCO (2022) emphasizes cultural industries as drivers of rural sustainability. For *kerchang*, packaging becomes both a cultural artifact and an economic asset. Through co-design and ethical branding, Orang Asli communities can ensure authenticity, share benefits, and engage ethically with wider markets (Langton & Teo, 2021).

2.4 Participatory Design in Cultural and Indigenous Contexts

Participatory design (PD) emphasizes shared decision-making, co-creation, and the redistribution of design authority to those most affected by design outcomes. Originating from Scandinavian democratic design movements, PD is now widely used to support marginalized communities by ensuring that their voices shape the design process and outputs (Sanders & Stappers, 2014). In Indigenous contexts, participatory design aligns with relational worldviews that emphasize collective ownership, reciprocity, and cultural continuity (Wilson, 2022). Scholars argue that PD safeguards cultural narratives, avoids misrepresentation, and strengthens community empowerment by embedding Indigenous knowledge directly into design outcomes (Jojola, 2006; Smith, 2012). Incorporating PD in the packaging of Kerchang ensures that cultural symbolism, material choices, and product narratives reflect Orang Asli perspectives rather than external interpretation.

3.0 Methodology

3.1 Research Design

This study uses a qualitative approach rooted in interpretivist and participatory traditions, prioritizing lived experiences and co-creation. Participatory design and design thinking guided the exploration of how packaging, culture, and sustainability intersect in Orang Asli traditional games. Fieldwork at the Muzium Orang Asli in Gombak included discussions and co-design sessions with museum staff and

an Orang Asli representative, revealing cultural values, material preferences, and symbolic meanings. The iterative process produced sustainable, culturally authentic packaging that centers Orang Asli voices and knowledge systems.

3.3 Data Collection and Analysis

Data were collected from three participant groups:

- Orang Asli representative ($n = 6$) — selected based on lived experience with traditional games, cultural knowledge, and community approval by museum staff.
- Muzium Orang Asli practitioners ($n = 5$) — selected for their expertise in cultural preservation, curation, and educational outreach.
- Design experts ($n = 4$) — comprising a senior packaging design lecturer and an experienced visual communication designer, chosen for their professional experience in sustainable materials and cultural design applications.

These participants were involved in discussions, sketch reviews, motif evaluations, and material testing. Data were analyzed using thematic analysis to identify cultural symbols, preferred materials, sustainability considerations, and user experience feedback. This approach ensured cultural relevance, contextual validity, and design integrity in developing sustainable packaging rooted in Orang Asli traditions.

3.4 Conceptual Framework

This study is guided by the Design Justice framework, which emphasizes the redistribution of design power, equitable participation, and the amplification of voices traditionally excluded from dominant design discourses (Costanza-Chock, 2020). Design Justice challenges the top-down, technocentric models of innovation by foregrounding the lived experiences, knowledge systems, and needs of marginalized communities. In the context of this study, it serves as a critical lens to examine how packaging design can become a vehicle for cultural empowerment and sustainable development among the Orang Asli. The framework is further enriched by principles drawn from Indigenous research paradigms, which prioritize relationality, reciprocity, storytelling, and communal ownership of knowledge (Wilson, 2008; Smith, 2021). These paradigms ensure that the research process and design outcomes are embedded in the cultural values and worldviews of the Orang Asli, rather than imposed externally. The resulting conceptual model proposed in this paper integrates three interdependent pillars: cultural integrity, which honours and represents traditional knowledge and symbolism; ecological sustainability, which informs the selection of materials and processes; and economic equity, as shown in Figure 1. This model aims to ensure benefit-sharing and support for community-based enterprises. Together, these pillars support a holistic, justice-oriented approach to sustainable packaging design.

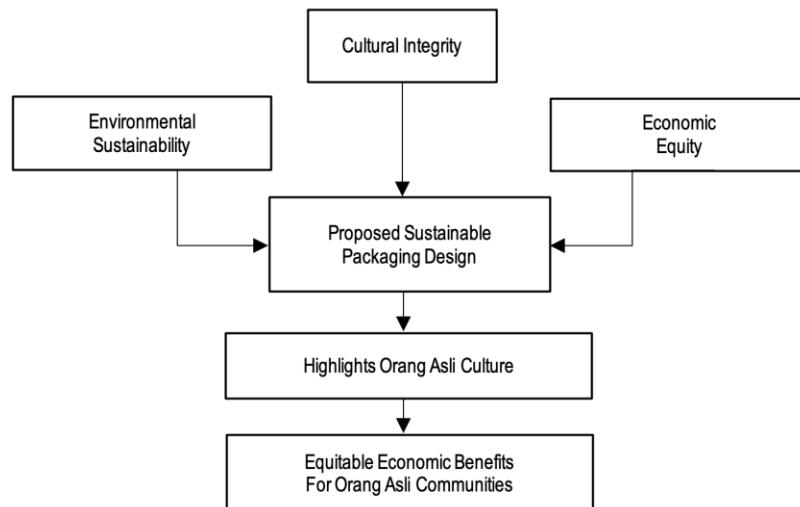


Fig. 1: Conceptual Model of Sustainable Packaging Design

4.0 Design Thinking Process

Designing packaging for Kerchang, a traditional Orang Asli puzzle, extends beyond branding into cultural storytelling. A human-centered design thinking approach guided ideation, prototyping, testing, and refinement to ensure the packaging reflects Orang Asli identity while appealing to broader markets. The visual design process highlights colour schemes, textures, motifs, and materials inspired by Orang Asli heritage, translating ethnographic insights into cohesive, culturally respectful, and sustainable design directions. The design thinking framework used in this study involved iterative steps: empathizing with the Orang Asli community, defining design challenges based on

cultural insights, generating creative ideas, prototyping with natural materials, and testing for usability and engagement. This process produced packaging rooted in tradition, cultural meaning, and community values.

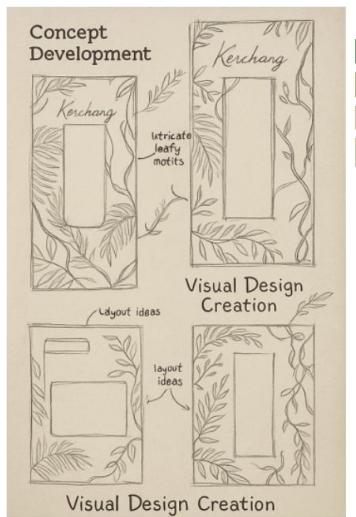


Figure 2: Visual Design Creation Process for Kerchang Packaging

This human-centered approach ensures that the final design is not only visually appealing but also respectful of tradition, practical, and aligned with community values. The Design Thinking process comprises several key steps, outlined as follows:

Step 1: Empathize: Understanding the Community and the Games

The first step was to understand this traditional game itself. This is to ensure that the voice of the Orang Asli was central to the design process from the beginning. *Kerchang* is more than a game; it is a symbol of tradition, storytelling, and play that has been passed down through generations. Designers visited the Orang Asli Gombak community to understand and observe the culture and their lifestyle, and to learn how the game was played. *Kerchang* is believed to serve a supernatural purpose. The puzzle could distract wandering spirits in the forest, allowing travellers to safely find their way home. It was even used as a test of wit and perseverance: a father would present the puzzle to a potential son-in-law, challenging his intelligence, patience, and problem-solving skills.

Step 2: Define: Framing the Design Challenge

Designing packaging for *Kerchang* that honours its cultural roots, embraces sustainability, and appeals to both Orang Asli and urban consumers involves a thoughtful blend of tradition, innovation, and environmental consciousness. With a understanding of the game's significance, we defined the challenge as "how might we design packaging for *Kerchang* that preserves its cultural essence, is environmentally responsible, and engages both Orang Asli and urban audiences. The motif and elements choose for *Kerchang* packaging is explained below:

i. Rattan Element

Rattan weaving is a vital element of Malaysian material culture, especially among Orang Asli communities, where it carries functional and symbolic significance. Incorporating rattan-inspired patterns and textures into Kerchang packaging honours this long-standing craft tradition and highlights artisanal knowledge passed down through generations. As a fast-growing, minimally processed natural material, rattan reflects environmental responsibility while symbolizing Orang Asli daily life. Its strength and flexibility have long supported the making of baskets, mats, and household tools. Beyond sustainability, rattan motifs enhance visual appeal. When combined with modern design elements, such as minimalist layouts or neutral palettes, they create packaging that balances rural authenticity with urban sophistication, bridging tradition and innovation for wider consumer relevance.

ii. Dense Forest Elements

Incorporating dense forest imagery into the packaging design of Kerchang serves as a compelling visual strategy to reflect the Orang Asli's profound relationship with nature. For generations, these communities have lived in harmony with Malaysia's tropical rainforests, relying on them not only for sustenance but also for cultural, spiritual, and medicinal knowledge. The use of forest motifs such as tree silhouettes and organic textures pays homage to this deep ecological bond.

From a design perspective, forest elements evoke authenticity, purity, and cultural rootedness, creating an emotional bridge between the product and its audience. For urban consumers, these visuals offer a glimpse into the forest-based lifestyle of the Orang Asli, fostering a sense of connection, curiosity, and respect. Forest-inspired packaging also contrasts effectively with modern, minimalist designs on store shelves, helping Kerchang stand out as a unique, artisanal product. When combined with other traditional elements like rattan patterns and earthy colours, forest imagery supports both cultural preservation and environmental messaging. It positions the packaging not only as an attractive container but as a visual narrative that invites users to engage with Indigenous heritage and values through a sustainable and meaningful lens.

iii. Earthy and Nature colour

The use of earth tones and natural colours, particularly shades of brown, beige and green plays a crucial role in communicating the Orang Asli's deep connection to nature. These colours were intentionally chosen to reflect the surrounding environment of the community which hold both practical and symbolic significance in Orang Asli daily life and cultural practices. Green evokes notions of growth, harmony, and environmental stewardship, aligning with the community's relationship to the forest as a living entity that sustains their physical and spiritual well-being. Similarly, earthy tones like brown and terracotta represent tradition and resilience, symbolizing the ancestral lands from which Orang Asli culture has evolved. These colour choices are not merely aesthetic decisions but are rooted in the Orang Asli worldview, which sees humans as part of an interdependent ecological system.

From a design perspective, this colour palette provides a visual coherence that reinforces the product's authenticity and ecological message. It helps position the packaging as both culturally respectful and environmentally responsible, appealing to consumers who are drawn to ethical, handmade, and nature-based products. The integration of natural colour schemes in packaging enhances emotional engagement, especially when used to express identity and cultural narratives.

Step 3: Ideate: Exploring Possibilities

The packaging design utilizes kraft card, to reflect the Orang Asli community's deep respect for nature and environmental harmony. Its raw, earthy texture visually aligns with the forest-inspired colour palette and natural motifs, reinforcing the eco-conscious narrative of the product. The structure features a simple, user-friendly assembly and opening mechanism, ensuring practicality for rural producers and ease of use for urban consumers.

To support cultural education and engagement, the packaging includes concise content that explains how to play Kerchang. This is further enhanced by an embedded QR code that links to a short instructional video, offering an interactive way to pass on traditional knowledge while appealing to digital-savvy audiences.

The design adopts a rectangular form with a strategically placed transparent window, allowing consumers to see the actual Kerchang puzzle inside. This not only highlights the craftsmanship of the game but also builds a visual connection between the product and its cultural origin. By combining functional design with cultural storytelling, the packaging serves as both a practical solution and a cultural ambassador, bridging Indigenous heritage and contemporary sustainable design.

4.1 The prototype Design

By following the iterative and user-centric approach of Design Thinking, we created Kerchang packaging prototypes that authentically reflect Orang Asli cultural heritage. This holistic approach fosters meaningful collaboration between designers and community members, ensuring that the final products are both impactful and culturally relevant and sustainable. Figure 3 shows the final design of Kerchang packaging.



Figure 3: Final Prototype Design of Kerchang Packaging

5.0 Findings and Discussion

The findings of this study emerged from three iterative co-design sessions involving the Orang Asli representative, museum practitioners,

and design experts. Four major themes were identified: (1) cultural symbolism as core design language, (2) ecological alignment through material selection, (3) the value of technology-assisted knowledge transfer, and (4) the role of packaging in cultural education and economic empowerment. These themes informed the prototype development and shaped the design attributes discussed below.

5.1 Cultural Integration in Packaging

Participants emphasized that packaging for Kerchang should not merely serve functional or aesthetic purposes but should act as a cultural messenger reflecting Orang Asli heritage. Motifs such as rattan weaving, forest silhouettes, and earth-toned palettes were validated by the Orang Asli representative as culturally accurate and symbolically meaningful. These elements reflect the community's deep ecological relationship and reinforce the puzzle's identity as a heritage artefact. The transparent window incorporated in the prototype was praised for showcasing the unique craftsmanship of the Kerchang puzzle. This aligns with Peters and Lee's (2023) argument that design acts as a relational interface where consumers connect visually and emotionally with cultural artefacts. The QR code-enabled instructions were also recognized as a modern tool to preserve oral knowledge while appealing to younger generations accustomed to digital learning.

5.2 Participatory Design as Empowerment

The participatory approach strengthened community ownership and cultural representation throughout the design process. The Orang Asli representative expressed a sense of pride seeing cultural motifs and forest-inspired elements authentically reflected in the prototype. This mirrors the participatory design principles outlined by Sanders & Stappers (2014), where users serve as co-creators, not passive informants. Intergenerational engagement also emerged during co-design activities. Elders shared stories about Kerchang's role in testing wit, guiding travelers, and symbolizing intelligence affirming Wilson's (2022) perspective that Indigenous knowledge is relational and story-driven. Younger participants gained renewed appreciation for the game, highlighting the potential role of design in cultural education and continuity.

5.3 Economic Potential and Market Positioning

Feedback from design experts and academic reviewers indicated strong commercial potential for the Kerchang packaging, especially in cultural tourism markets, museum gift shops, and heritage-based retail environments. The ethical branding strategy featuring profiles of artisans and community contributors accessed through QR code was seen as a valuable feature promoting transparency, authenticity, and value-added storytelling. Embedding cultural narratives in packaging aligns with UNESCO's (2022) framework for sustainable cultural industries, which emphasizes empowering communities through cultural entrepreneurship. The study thus positions Kerchang not only as a cultural artefact but as a culturally responsible product with economic relevance.

5.4 Challenges

Despite positive outcomes, several challenges were identified. These include ensuring cultural accuracy when scaling production, protecting Indigenous intellectual property, addressing affordability of sustainable materials, and maintaining community participation throughout commercialization. These challenges underscore the need for ethical governance mechanisms and long-term institutional support to safeguard cultural ownership.

6.0 Conclusion and Recommendation

This study demonstrates that sustainable packaging can function as an effective tool for cultural preservation, ecological responsibility, and socio-economic empowerment when grounded in participatory and culturally informed approaches. By centering Orang Asli voices and integrating their cultural knowledge into design decisions, the Kerchang packaging prototype successfully reflects cultural authenticity while fulfilling functional design requirements. The use of natural motifs, forest-inspired aesthetics, eco-friendly materials, and QR-linked instructions aligns with sustainability principles and supports the transmission of Indigenous knowledge. The findings reinforce the importance of participatory design in ensuring that cultural products are represented respectfully and meaningfully.

The study's scope is limited by a small participant group representing a single Orang Asli subgroup (Jakun). Data were primarily qualitative, and broader consumer testing was not conducted. Resource constraints also limited exploration of advanced sustainable materials and large-scale production feasibility. Future research should expand community involvement to additional Orang Asli subgroups, conduct wider market and usability testing, and develop frameworks for Indigenous intellectual property protection. Collaboration with tourism agencies, cultural institutions, and ethical industry partners is recommended to support sustainable scaling of the packaging concept.

Paper Contribution to the Related Field of Study

This paper contributes to the fields of design research, Indigenous studies, and sustainable development by presenting a culturally grounded packaging design process. It highlights how participatory methods and design justice principles can support cultural preservation, ecological responsibility, and economic empowerment, offering a replicable model for ethical design practices involving Indigenous communities.

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