

Digital Technology-Augmented Indigenous Knowledge Management: A Qualitative Exploration of Sustainable Competitiveness among Bamboo Craft MSMEs in Tasikmalaya, Indonesia

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ABSTRACT

Digital technologies are increasingly reshaping creative industries by expanding access to design references, market intelligence, external knowledge, and digital communication opportunities. However, limited attention has been given to how digital technologies interact with indigenous knowledge systems in traditional craft communities, particularly how digitally mediated resources can be incorporated without displacing culturally embedded expertise and experiential craftsmanship. Addressing this gap, this study explores how digital technology-augmented indigenous knowledge management supports sustainable competitiveness among bamboo craft micro, small, and medium enterprises (MSMEs) in Tasikmalaya, Indonesia.

This study employed an interpretive qualitative approach using the Gioia methodology. Data were collected through a Focus Group Discussion (FGD) and semi-structured in-depth interviews with three master bamboo craftsmen representing established bamboo craft practices in Tasikmalaya. The inquiry examined indigenous knowledge, intergenerational learning, experiential craftsmanship, community interaction, product innovation, knowledge protection, market adaptation, and the role of digital technologies in accessing external knowledge and creative resources. The empirical material was analyzed iteratively, progressing from informant-centered first-order concepts to researcher-interpreted second-order themes and six aggregate dimensions.

The findings indicate that sustainable competitiveness is not primarily a function of digital technology adoption alone but emerges through interconnected indigenous knowledge management processes encompassing Indigenous Knowledge Assets, Community Knowledge Ecosystem, Experiential Learning and Knowledge Creation, Adaptive Innovation Capability, Knowledge Protection, and Sustainable Competitiveness. Digital technology operates across these processes as an augmentation layer, expanding access to creative references, market intelligence, external knowledge, and communication opportunities. Rather than replacing indigenous craftsmanship, digitally mediated resources acquire value through artisans' selective interpretation and transformation grounded in experiential craftsmanship, ecological knowledge, cultural identity, and human judgement.

Based on these findings, the study develops the Digital Technology-Augmented Indigenous Knowledge Management Cycle (DT-IKMC) as a preliminary, empirically grounded conceptual framework for understanding how indigenous knowledge is inherited, collectively enriched, transformed through experience, mobilized for innovation, protected, and translated into sustainable competitiveness. Artificial Intelligence (AI) is positioned within this framework as one form of AI-enabled digital technology rather than as a separate theoretical construct or alternative framework. The study contributes to knowledge management scholarship by bringing together the Knowledge-Based View, Community of Practice, and Dynamic Capabilities perspectives to explain how culturally embedded knowledge can be continuously renewed while engaging with digitally mediated resources. Practically, the findings provide insights for policymakers, creative-industry practitioners, and bamboo craft MSMEs seeking to strengthen competitiveness while maintaining indigenous expertise, cultural identity, and human judgement as foundations of sustainable innovation.

Keywords: Indigenous knowledge management; Artificial intelligence; Knowledge management; Sustainable competitiveness; Bamboo craft MSMEs; Gioia methodology.

1. INTRODUCTION

Digital transformation is increasingly reshaping how small and medium-sized enterprises (SMEs) create, access, and manage knowledge. Digital platforms, online marketplaces, social media, and other digital technologies provide new opportunities for firms to access external information, identify market trends, develop products, and communicate value to customers. However, technological transformation creates a particular challenge for traditional creative industries whose competitiveness depends heavily on knowledge accumulated through practice, cultural identity, tacit skills, and intergenerational transmission. For these enterprises, the central challenge is not simply whether digital technologies can be adopted, but how technological change can be accommodated without weakening the indigenous knowledge that constitutes the foundation of their distinctive capabilities.

In this study, digital technology is understood broadly to include digital platforms, social media, online marketplaces, digitally mediated visual references, and, where applicable, AI-enabled tools. This broader conceptualization recognizes Artificial Intelligence as an increasingly advanced component of the digital technology landscape rather than treating it as a separate technological domain. Accordingly, the study focuses empirically on how digital technologies augment indigenous knowledge management, while considering AI as an emerging technological possibility within this broader transformation.

This tension is particularly relevant in craft-based industries, where knowledge is embedded in materials, techniques, aesthetic judgement, cultural meanings, and experiential learning that are often difficult to codify and transfer through formal systems. Bamboo craftsmanship provides a particularly important context because the value of bamboo products extends beyond their physical characteristics to include craftsmanship, local ecological knowledge, cultural identity, and accumulated experience in selecting, processing, shaping, and transforming bamboo materials. The sustainability of such enterprises therefore depends on their capacity to preserve the knowledge that distinguishes them while continuously adapting products and practices to changing consumer preferences, market conditions, and technological environments.

The Knowledge-Based View (KBV) provides an important foundation for understanding this issue by conceptualizing knowledge as a strategic resource underlying organizational capability and competitive advantage. From this perspective, indigenous craft knowledge can constitute a valuable and difficult-to-replicate resource because it is embedded in accumulated experience, tacit skills, cultural practices, and locally situated understanding. However, knowledge-based explanations alone provide limited insight into how such knowledge is collectively created, shared, and renewed within communities of practitioners. Community of Practice (CoP) theory addresses this dimension by emphasizing learning through participation, social interaction, shared practice, and the exchange of situated knowledge. In craft communities, knowledge is therefore not merely possessed by individual craftsmen but is continuously developed through interaction, observation, imitation, experimentation, and intergenerational learning.

The Dynamic Capabilities perspective further extends this understanding by explaining how firms mobilize and reconfigure existing resources in response to changing environments. For traditional creative enterprises, maintaining competitiveness requires more than preserving inherited knowledge. It requires the capacity to sense changes in markets and consumer preferences, seize opportunities for product and design development, and transform existing

knowledge into new forms while maintaining distinctive cultural and craft characteristics. The intersection of KBV, CoP, and Dynamic Capabilities therefore provides a useful theoretical foundation for examining how indigenous knowledge can remain strategically valuable while being continuously adapted in changing technological and market environments.

Despite these theoretical insights, an important gap remains in the literature. Existing research on digital transformation has largely emphasized technology adoption, digital capabilities, automation, and productivity, while studies of indigenous and traditional knowledge have tended to focus on preservation, transmission, cultural continuity, and community-based learning. Less attention has been given to the intersection between indigenous knowledge management and digital technological change, particularly how digital technologies can expand the knowledge environment of traditional creative enterprises without displacing the tacit knowledge and cultural authority of knowledge holders. This gap is important because technological transformation should not necessarily be understood as a process in which digital technologies replace traditional knowledge. It may instead involve a process of knowledge augmentation, whereby external digital resources expand opportunities for exploration, learning, adaptation, and innovation while indigenous knowledge remains the foundation for interpretation and decision-making.

This gap is especially significant in Indonesia, where traditional creative industries are closely connected to local cultural knowledge and community-based production systems. Tasikmalaya City in West Java provides a relevant empirical setting because bamboo craftsmanship has developed through long-standing practices involving material knowledge, artisanal skills, product innovation, and community-based knowledge transmission. Yet bamboo craft MSMEs face continuing challenges associated with changing consumer preferences, product differentiation, competition from alternative materials, market development, regeneration of craft skills, and the need to maintain cultural authenticity while responding to contemporary demands. These conditions raise an important question regarding how traditional craft knowledge can remain relevant and competitive in an increasingly digital environment.

Addressing this gap requires an approach capable of capturing the complexity and socially embedded nature of indigenous knowledge management. This study therefore adopts an interpretive qualitative approach using Gioia Methodology to investigate how bamboo craft MSMEs in Tasikmalaya create, share, transform, protect, and renew indigenous knowledge. KBV, CoP, and Dynamic Capabilities are employed as complementary interpretive lenses rather than predetermined coding categories, allowing empirical patterns to emerge inductively from participants' experiences and practices. This positioning is important because the study does not seek to test whether existing theories predict the behavior of bamboo craft MSMEs. Instead, it seeks to understand how established theoretical perspectives can illuminate an empirically grounded process of indigenous knowledge management under conditions of technological change.

Accordingly, this study aims to explore how bamboo craft MSMEs in Tasikmalaya manage indigenous knowledge in responding to digital technological change and how these knowledge-management processes contribute to sustainable competitiveness. More specifically, the study examines how indigenous knowledge assets, community-based knowledge exchange, experiential learning, innovation, and knowledge protection interact as craftsmen navigate changing technological and market environments. Through this analysis,

the study seeks to develop an empirically grounded conceptual framework explaining how digital technology can function as an augmentation layer within indigenous knowledge management rather than as a replacement for traditional craftsmanship.

The study contributes to knowledge management and creative-industry research in three ways. First, it extends the Knowledge-Based View by highlighting indigenous knowledge as a strategically significant resource whose value is sustained through continuous learning, adaptation, and protection. Second, it enriches the Community of Practice perspective by showing how community-based knowledge processes can support the renewal of traditional craft knowledge under changing environmental conditions. Third, it extends the Dynamic Capabilities perspective by connecting sensing, adaptation, and innovation with the preservation and transformation of tacit indigenous knowledge. Taken together, these insights provide a basis for conceptualizing Digital Technology-Augmented Indigenous Knowledge Management as a process through which traditional knowledge can remain culturally grounded while evolving in response to contemporary technological and market conditions.

2. LITERATURE REVIEW

2.1 Knowledge-Based View: Indigenous Knowledge as a Strategic Resource

Digital technology, including emerging AI-enabled applications, can expand the resources available for knowledge creation, creative exploration, market sensing, and digital communication. However, the extent to which such technologies contribute to indigenous knowledge management depends on how artisans interpret, adapt, and integrate digitally mediated information through their existing experiential and cultural knowledge.

The Knowledge-Based View (KBV) extends the Resource-Based View by arguing that knowledge constitutes the firm's most valuable strategic resource because it is difficult to imitate, socially embedded, and accumulated through organizational learning. Unlike tangible resources, knowledge enables firms to continuously generate innovation, adapt to environmental change, and sustain long-term competitive advantage. The KBV therefore positions knowledge as the primary source of organizational value creation rather than physical assets alone. Recent reviews further highlight that knowledge resources become increasingly strategic when integrated with organizational learning and dynamic capabilities (Tamirat & Amentie, 2023).

Within indigenous creative industries, competitive advantage rarely depends on advanced machinery or production scale. Instead, it emerges from tacit craftsmanship, ecological understanding, accumulated experience, and culturally embedded production practices that evolve through generations. Such knowledge is highly context-specific and socially embedded, making it difficult for competitors to imitate despite having access to similar technologies or raw materials.

In bamboo craft MSMEs, indigenous knowledge extends beyond weaving techniques to encompass bamboo cultivation, species selection, harvesting periods, preservation methods, quality control, finishing techniques, and product aesthetics. These knowledge assets collectively create distinctive capabilities that differentiate master craftsmen from mass producers. Consequently, indigenous knowledge should be understood not merely as cultural

heritage but as a strategic organizational resource capable of generating sustainable competitiveness.

Nevertheless, most KBV research has been developed within formal organizational settings, emphasizing firms, corporations, and structured managerial systems. Comparatively little attention has been devoted to explaining how strategic knowledge is collectively inherited, shared, and renewed within indigenous craft communities facing digital transformation (Aparicio et al., 2021).

2.2 Community of Practice: Knowledge Beyond Organizational Boundaries

Knowledge creation within traditional craft industries differs fundamentally from formal organizational knowledge management systems. Rather than relying on codified procedures, bamboo craft communities exchange tacit knowledge through observation, apprenticeship, collaborative production, informal discussion, and reciprocal learning. These characteristics closely align with the concept of Communities of Practice (CoP), which views learning as a socially situated process emerging through sustained participation among practitioners sharing common identities and expertise.

Communities of Practice facilitate learning by enabling members to exchange experiences, solve practical problems collectively, and continuously refine their professional practices. Beyond knowledge transfer, CoPs function as important mechanisms for innovation by strengthening collaboration, trust, and collective capability development (Pattinson et al., 2016).

For bamboo craft MSMEs, knowledge exchange extends beyond local craftsmen. Community learning increasingly involves universities, government training institutions, exhibitions, artisan associations, and interregional collaboration networks. Such interactions create a broader community knowledge ecosystem, where indigenous knowledge is simultaneously preserved and enriched through external collaboration. Despite growing recognition of collaborative learning, existing knowledge management research has paid relatively limited attention to community-based indigenous enterprises operating outside formal organizational boundaries.

2.3 Dynamic Capabilities and Digital Technology-Augmented Innovation

The Dynamic Capabilities perspective provides an important lens for understanding how bamboo craft MSMEs respond to technological and market changes while maintaining the value of indigenous knowledge. Dynamic capabilities refer to an organization's capacity to integrate, build, and reconfigure internal and external competencies in response to rapidly changing environments (Teece, Pisano, & Shuen, 1997). Teece (2007) further conceptualizes dynamic capabilities through the interconnected processes of sensing opportunities and threats, seizing opportunities through appropriate resource mobilization, and transforming or reconfiguring existing resources and capabilities. This perspective is particularly relevant to traditional creative industries because competitiveness depends not only on preserving existing knowledge but also on the capacity to renew and adapt that knowledge under changing environmental conditions.

In bamboo craft MSMEs, adaptive capability is closely connected to the ability of craftsmen to reinterpret inherited knowledge in response to changing consumer preferences,

market requirements, material conditions, and design trends. Indigenous knowledge should therefore not be viewed as a static resource that is preserved unchanged across generations. Rather, its strategic value can be sustained when craftsmen continuously learn, experiment, modify existing practices, and combine inherited knowledge with new sources of information. From a Dynamic Capabilities perspective, such processes represent the continuous renewal and reconfiguration of knowledge-based resources required to maintain competitiveness in dynamic environments.

Digital technologies provide an additional mechanism through which these adaptive processes can be supported. Digital platforms, social media, online marketplaces, Pinterest, and digital visual resources can expand craftsmen's access to external information, design references, market signals, and opportunities for product presentation. These technologies can therefore support the **sensing** dimension of dynamic capabilities by enabling craftsmen to observe changing aesthetic preferences, emerging product forms, customer expectations, and broader market developments. However, access to digital information does not automatically generate innovation. The relevance and applicability of external information remain dependent on the craftsmen's experiential knowledge, technical expertise, cultural understanding, and judgement.

The seizing dimension involves translating sensed opportunities into concrete product and market responses. For bamboo craft MSMEs, this may involve modifying existing designs, developing new product forms, adapting products to contemporary interior and lifestyle contexts, or improving product presentation and storytelling. Digital technologies can facilitate this process by providing references and channels through which new ideas can be explored and communicated. Nevertheless, the transformation of external references into distinctive bamboo products remains dependent on indigenous craftsmanship and experiential learning. Digital technology therefore functions as an augmentation mechanism, rather than a substitute for the tacit knowledge of craftsmen.

The reconfiguring dimension becomes evident when craftsmen integrate new knowledge and external references with established craft practices. This process may require changes in design, production techniques, product positioning, or knowledge-sharing practices while retaining the cultural and material characteristics that distinguish bamboo craftsmanship. Such reconfiguration allows traditional knowledge to remain relevant without losing its authenticity. In this sense, innovation does not necessarily imply abandoning inherited practices; instead, it can involve selectively recombining existing indigenous knowledge with new information and contemporary market requirements.

This perspective also helps clarify the relationship between digital technology and indigenous knowledge management. Digital technology does not constitute the primary source of competitive advantage in itself. Rather, its value depends on how effectively craftsmen and their communities integrate digital information into existing knowledge processes. The strategic resource remains the accumulated indigenous knowledge embedded in tacit craftsmanship, ecological understanding, cultural identity, experiential learning, and community-based practices. Digital technology expands the environment in which this knowledge can be accessed, interpreted, recombined, and applied.

Accordingly, this study conceptualizes digital technology-augmented innovation as a process in which digital resources expand opportunities for sensing, learning, experimentation, and market adaptation while indigenous knowledge provides the interpretive and productive

foundation for innovation. This conceptualization differs from an AI-centric view of innovation because the empirical context of this study does not establish systematic adoption of specific AI systems by the participating craftsmen. Instead, the evidence points more clearly to the use of digital platforms and online resources as complementary sources of creative inspiration, market information, product references, and communication opportunities.

The Dynamic Capabilities perspective therefore complements the Knowledge-Based View and Community of Practice perspective adopted in this study. While the Knowledge-Based View explains why indigenous knowledge can constitute a strategic resource, Community of Practice emphasizes how such knowledge is socially shared and developed through participation and interaction. Dynamic Capabilities adds an explanation of how this knowledge is continuously adapted and reconfigured in response to technological and market change. The integration of these perspectives provides a theoretical basis for understanding how bamboo craft MSMEs can preserve indigenous knowledge while simultaneously renewing it through digitally expanded knowledge environments.

Within the context of this study, sustainable competitiveness consequently emerges not from technological adoption alone but from the interaction between indigenous knowledge assets, community-based knowledge processes, experiential learning, adaptive innovation, knowledge protection, and digitally enabled environmental sensing. Digital technology serves as an enabling layer that broadens access to external knowledge and market information, while the craftsmen's tacit expertise, cultural identity, and experiential judgement determine how such resources are interpreted and transformed into distinctive products. This positioning provides the theoretical foundation for examining digital technology-augmented indigenous knowledge management among bamboo craft MSMEs in Tasikmalaya.

2.4 Towards a Digital Technology-Augmented Indigenous Knowledge Management Perspective

The preceding discussion indicates that no single theoretical perspective fully explains how traditional craft communities sustain competitiveness amid technological and market change. The Knowledge-Based View explains the strategic value of indigenous knowledge but provides limited insight into how such knowledge evolves collectively. Community of Practice highlights the social processes through which tacit knowledge is created, shared, and transferred, yet provides less explanation of how communities adapt their knowledge to changing external environments. Dynamic Capabilities, in turn, explains the adaptation and reconfiguration of resources and capabilities, but offers limited attention to indigenous knowledge embedded in local culture, community practices, and traditional craftsmanship.

This study therefore positions sustainable competitiveness among bamboo craft MSMEs as emerging from the interaction of these complementary perspectives. Indigenous knowledge constitutes the strategic knowledge resource, community-based interaction facilitates its creation, sharing, and transmission, while adaptive capabilities enable its transformation and renewal in response to changing markets and technological conditions. Within this process, digital technology functions as an augmentation layer that expands access to external knowledge, creative references, market information, and opportunities for product development and communication, while indigenous knowledge remains the foundation for interpretation, adaptation, and decision-making.

Importantly, this positioning does not conceptualize digital technology as a substitute for traditional craftsmanship. Rather, digital resources can broaden the knowledge environment in which craftsmen operate, enabling them to encounter new design references, observe market developments, explore product possibilities, and communicate the cultural and functional value of bamboo products. The strategic value of such technologies therefore depends on how they are integrated with tacit craftsmanship, experiential learning, cultural identity, ecological knowledge, and community-based knowledge practices. This perspective shifts the focus from technology adoption alone toward the augmentation of indigenous knowledge through digitally expanded knowledge environments.

Guided by this integrated theoretical perspective, the present study adopts the Gioia Methodology to inductively explore how master bamboo craftsmen preserve, share, transform, protect, and renew indigenous knowledge while responding to changing technological and market environments. The three theoretical perspectives are employed as complementary interpretive lenses rather than predetermined coding categories, allowing empirically emergent concepts and relationships to inform the development of the theoretical framework.

Based on the empirical findings, this study develops the Digital Technology-Augmented Indigenous Knowledge Management Cycle (DT-IKMC) as an empirically grounded framework explaining how indigenous knowledge can remain culturally rooted while continuously evolving through community-based knowledge processes, experiential learning, adaptive innovation, knowledge protection, and digitally expanded access to external knowledge and market information. The framework positions digital technology not as the primary source of competitive advantage, but as an enabling layer that strengthens the capacity of indigenous knowledge to evolve and contribute to sustainable competitiveness among bamboo craft MSMEs in Tasikmalaya, Indonesia.

2.5 Theoretical Positioning of Digital Technology Augmentation

Existing perspectives on indigenous knowledge and knowledge-based competitiveness primarily emphasize the value of tacit, culturally embedded, and socially transmitted knowledge. However, less attention has been given to how digital technologies may interact with such knowledge without displacing the cultural and experiential foundations on which it is built.

Existing literature suggests that digital and AI-enabled technologies can augment human capabilities, facilitate human–AI interaction, support hybrid intelligence, and expand creative possibilities (Amershi et al., 2019; Dellermann et al., 2019; Anantrasirichai & Bull, 2022; Dwivedi et al., 2023). The present study extends this discussion empirically by demonstrating how digitally mediated resources are selectively interpreted and transformed through indigenous knowledge and experiential craftsmanship among bamboo craft MSMEs in Tasikmalaya.

However, these studies primarily address human–AI interaction, hybrid intelligence, creative industries, or the broader implications of generative AI. They do not directly explain how digitally mediated resources interact with indigenous knowledge systems or culturally embedded craftsmanship. This distinction is important because the presence of digital technology does not, by itself, demonstrate knowledge augmentation. Whether digital resources become meaningful knowledge depends on how they are interpreted, adapted, and incorporated within existing knowledge practices.

This study therefore approaches digital technology augmentation as an empirical question rather than a theoretical assumption. The empirical findings show that artisans use digital platforms and AI-enabled digital technologies to access creative references, market information, external knowledge, and communication opportunities. These resources do not independently generate indigenous knowledge or replace craftsmanship. Instead, artisans selectively interpret and transform them through accumulated experience, ecological understanding, cultural values, and human judgement. In this sense, the existing literature establishes the possibility of technological augmentation, whereas the present study demonstrates how such augmentation operates within the indigenous knowledge practices of bamboo craft MSMEs in Tasikmalaya.

In this study, digital technology is used as the broader conceptual category encompassing digital platforms, online communication and market channels, visual reference platforms, and AI-enabled technologies. Artificial Intelligence is therefore treated as one form of AI-enabled digital technology within the broader augmentation layer, rather than as a separate theoretical construct or an alternative framework. This distinction is important because the study does not assume that technological adoption itself generates competitiveness. Instead, it examines how externally accessed digital resources acquire meaning and value when mediated through indigenous knowledge, craftsmanship experience, cultural identity, and human judgement.

The resulting theoretical positioning is that digital technology expands the knowledge environment surrounding indigenous craftsmanship rather than replacing the knowledge system itself. Digital platforms and AI-enabled technologies may broaden access to external references, market intelligence, creative resources, and communication opportunities, but their contribution to knowledge development depends on artisans' capacity to selectively interpret, adapt, and transform these resources through culturally embedded and experiential knowledge. This positioning emphasizes augmentation rather than substitution and provides the conceptual basis for examining how digital resources interact with indigenous knowledge management. This conceptual positioning is illustrated in Figure 1.

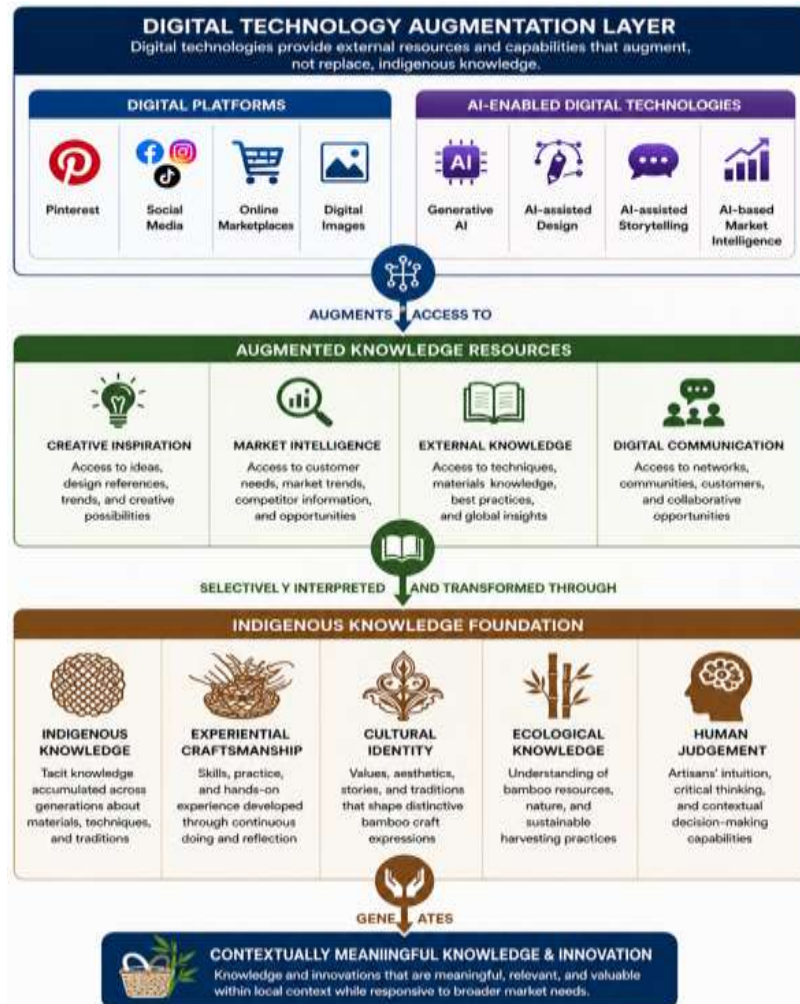


Figure 1. Digital Technology Augmentation Layer within Indigenous Knowledge Management

Figure 1 illustrates this positioning by distinguishing digitally mediated resources from the indigenous knowledge processes through which these resources acquire contextual meaning. Digital technology broadens what artisans can access, explore, compare, and communicate, while indigenous knowledge, experiential craftsmanship, ecological understanding, cultural identity, and human judgement shape how these resources are interpreted, adapted, and applied. The figure therefore establishes the conceptual boundary of the study: digital technology is treated as an augmentation mechanism within indigenous knowledge management, while the knowledge, judgement, and craftsmanship embedded in artisans' practices remain central to determining what is technically feasible, culturally appropriate, and commercially relevant.

3. METHODS

To investigate how indigenous knowledge management unfolds within bamboo craft MSMEs under changing technological and market conditions, this study employed an

interpretive qualitative research design guided by the Gioia methodology. The research focused on practitioners' lived experiences and practices to develop an empirically grounded understanding of how knowledge is maintained, transformed, and mobilized in support of sustainable competitiveness.

3.1 Research Design

This study employed an interpretive qualitative design to examine how bamboo craft practitioners in Tasikmalaya experience and make sense of indigenous knowledge within their everyday practices. The design was particularly appropriate because the phenomenon under investigation involves tacit craftsmanship, cultural values, ecological understanding, intergenerational learning, and socially embedded knowledge practices that cannot be adequately captured through predefined variables or causal measures. Rather than testing predetermined hypotheses, the study sought to understand how participants interpret, negotiate, and adapt their knowledge in response to changing market and technological conditions.

The empirical analysis followed the Gioia methodology (Gioia et al., 2013), which provides a systematic approach for developing concepts from informants' accounts while maintaining a distinction between participant-centered meanings and researcher-level interpretation. The analysis moved from first-order concepts that remained close to participants' expressions and experiences, through second-order themes that captured broader patterns of meaning, to aggregate dimensions representing higher-level conceptual relationships emerging from the empirical material.

The study was inductive in orientation, with the Knowledge-Based View, Community of Practice, and Dynamic Capabilities serving as complementary theoretical lenses for interpreting the emerging findings rather than as predetermined coding categories. This distinction was important for preserving the empirical grounding of the analysis. The researchers first examined how knowledge was experienced and managed within the bamboo craft context and subsequently related the emerging patterns to established perspectives on strategic knowledge, collective learning, and adaptive capability.

The research process comprised four interconnected stages. First, empirical inquiry was conducted through a Focus Group Discussion, in-depth interviews, field observations, and documentary evidence to develop a contextual understanding of bamboo craftsmanship and knowledge practices. Second, the empirical material was analyzed iteratively using Gioia-based coding, progressing from first-order concepts to second-order themes and aggregate dimensions. Third, the emerging dimensions were interpreted in relation to the complementary theoretical perspectives. Fourth, the resulting conceptual relationships were synthesized into a preliminary framework explaining how indigenous knowledge management, digitally expanded knowledge environments, adaptive innovation, and knowledge protection may contribute to sustainable competitiveness. Figure 2 summarizes this research process.

The research process comprised four interconnected stages: Interpretive qualitative inquiry, Gioia-based inductive analysis, empirical theory building, and preliminary conceptual framework development. The first stage established an in-depth understanding of participants' lived experiences and practices within their social and cultural context. The second stage transformed empirical material into first-order concepts, second-order themes, and aggregate dimensions through iterative Gioia-based analysis. The third stage involved interpreting the emerging empirical relationships through complementary theoretical perspectives. The final

stage synthesized these empirically derived relationships into a preliminary conceptual framework explaining how digital technology may augment indigenous knowledge management in support of sustainable competitiveness.



Figure 2. Research Process from Interpretive Inquiry to the Preliminary Conceptual Framework

Figure 2 summarizes the research pathway from empirical inquiry to preliminary conceptual development. The process was iterative rather than strictly linear, allowing emerging interpretations to inform subsequent data collection, comparison, and analytical refinement. The figure distinguishes the empirical stages of the study from the subsequent conceptual interpretation, thereby establishing the methodological foundation for the Gioia data structure presented in the Findings section.

3.2 Research Context

The study was conducted in Tasikmalaya City, West Java, Indonesia, a region with a longstanding tradition of bamboo craftsmanship and community-based creative industries. The empirical setting primarily encompasses bamboo craft communities in Situ Beet (Kampung Situbeet), Cipari Village, Mangkubumi District, together with selected bamboo craft enterprises operating within Tasikmalaya. The area provides a relevant context for examining indigenous knowledge management because craftsmanship is closely embedded in intergenerational learning, community interaction, ecological knowledge, and artisanal production practices.

The bamboo craft ecosystem in Tasikmalaya includes experienced master craftsmen and small-scale enterprises producing a range of functional and decorative products, including household items, interior ornaments, lighting products, bamboo blinds, accessories, and customized handicrafts. Production knowledge is largely developed through prolonged practical experience, observation, apprenticeship, and participation in family or community-based production activities. This setting therefore provides access to practitioners whose knowledge encompasses not only technical craftsmanship but also material selection, product development, quality judgement, and adaptation to customer requirements.

Tasikmalaya was purposively selected because its bamboo craft sector represents a context in which culturally embedded knowledge coexists with changing market conditions and increasing exposure to digital technologies. Artisans interact with customers, fellow craftsmen, institutions, exhibitions, and digitally mediated resources as part of their ongoing learning and product development processes. This combination provides an appropriate empirical setting for investigating how indigenous knowledge is maintained, interpreted, renewed, and applied under conditions of digital technological change.

The context is particularly relevant to the present study because digital technology is not examined as an independent replacement for traditional craftsmanship, but as part of the broader knowledge environment surrounding artisans. Digital platforms and digitally mediated resources may provide access to external design references, market information, communication channels, and other forms of knowledge that craftsmen can selectively interpret through their existing experiential and culturally embedded knowledge. The study therefore examines how these interactions are experienced and managed by bamboo craft practitioners and how they relate to the development of sustainable competitiveness. The research context is intentionally bounded to bamboo craft MSMEs in Tasikmalaya. This contextual boundary is important because the study does not assume that the emerging relationships among indigenous knowledge, community learning, digital technology, adaptive innovation, and competitiveness operate identically across all creative industries. Instead, the specific characteristics of the Tasikmalaya bamboo craft ecosystem provide the empirical conditions from which the subsequent Gioia analysis develops a preliminary conceptual explanation.

3.3 Participants and Data Sources

The primary empirical evidence was obtained from three purposively selected master bamboo craftsmen in Tasikmalaya, Indonesia. Participants were selected based on their extensive experience in bamboo craftsmanship and their direct involvement in knowledge transmission, product development, innovation, community interaction, and market adaptation. Rather than seeking statistical representativeness, the purposive sampling strategy aimed to

identify information-rich practitioners whose accumulated experience could provide detailed insights into the indigenous knowledge processes examined in this study. The three key informants possessed distinctive areas of expertise that were particularly relevant to the research phenomenon. Their complementary backgrounds provided different but interconnected perspectives on how indigenous knowledge is maintained, transformed, applied, and renewed within bamboo craft MSMEs. Table 1 summarizes the distinctive areas of expertise represented by the three key informants:

Table 1. Distinctive Areas of Expertise of Key Informants

Key Informant	Distinctive Area of Expertise Relevant to the Study
H. Ade Suherman (CV. Atlas Duta Kriya)	Knowledge transformation and product innovation: Transforming ideas and external references into distinctive bamboo products while coordinating craftsmanship and human resources to realize innovative designs.
H. Mumus (Situ Beet Bamboo Craft Community)	Experiential craftsmanship and community-based learning: Extensive practical experience in bamboo weaving, product diversification, and collaborative knowledge exchange within the local artisan community.
H. Iwan (Rineka Karya Art)	Knowledge continuity, market adaptation, and digital engagement: Sustaining family-based bamboo craft traditions while developing contemporary products and using digital platforms, including Pinterest, as sources of design and market references.

The individual interviews were complemented by a Focus Group Discussion (FGD), field observations, and documentary or artefactual evidence. The FGD provided a collective setting for examining shared experiences and interactions concerning craftsmanship, knowledge exchange, innovation, and adaptation. Field observations provided contextual evidence concerning production practices, material preparation, product development, and interactions within the craft environment, while documentary and artefactual materials supported the contextual interpretation of participants' accounts and craft outputs.

These sources served complementary rather than interchangeable purposes. The in-depth interviews provided detailed individual accounts of practitioners' experiences and interpretations, the FGD captured collective perspectives and interaction, and observations and documentary or artefactual materials provided contextual evidence concerning the practices and products associated with indigenous knowledge management. The combination of these sources enabled the researchers to compare individual narratives with collective accounts and contextual evidence during the subsequent analysis.

3.4 Data Collection

Data were collected between February and April 2026 using multiple qualitative techniques to develop a contextual understanding of indigenous knowledge management within bamboo craft MSMEs in Tasikmalaya. The study combined a Focus Group Discussion (FGD), semi-structured in-depth interviews, non-participant field observations, and documentary evidence. These sources were designed to provide complementary forms of evidence rather than duplicate the same information. The FGD captured collective perspectives, interviews explored individual experiences and interpretations, observations documented knowledge as enacted in practice, and documentary evidence provided contextual support for interpreting participants' accounts.

3.4.1 Focus Group Discussion and In-Depth Interviews

The FGD was conducted as an exploratory component of the data collection process. The discussion addressed indigenous craftsmanship, knowledge transmission, collaborative learning, product and design innovation, market adaptation, and the role of digital technologies in contemporary craft practices. The purpose was not to establish predetermined analytical categories but to identify issues and areas of experience requiring deeper exploration in subsequent individual interviews. Insights emerging from the FGD informed the refinement and contextualization of the semi-structured interview protocol.

Following the FGD, semi-structured in-depth interviews were conducted with the three purposively selected master bamboo craftsmen described in Section 3.3. The semi-structured format ensured consistency across interviews while allowing participants to elaborate on experiences and practices that emerged during the conversations. The interview protocol covered the origins and transmission of indigenous knowledge, intergenerational learning, community-based knowledge sharing, product and design innovation, market adaptation, quality management, knowledge protection, responses to product imitation, and the use of digital technologies for creativity and business development.

Each interview lasted approximately 60–120 minutes, was audio-recorded with participants' informed consent, and subsequently transcribed verbatim for analysis. The combination of the FGD and individual interviews allowed the researchers to examine both shared community perspectives and the distinctive experiences of individual master craftsmen.

3.4.2 Field Observations and Documentary Evidence

To complement participants' accounts, non-participant field observations were conducted at participants' workshops and production sites. Observations focused on bamboo material selection, weaving techniques, production processes, quality control, product diversification, interactions among craftsmen, and characteristics associated with authentic products and their differentiation from imitations. The observations provided contextual evidence for understanding how knowledge was enacted through everyday craftsmanship practices.

The study also incorporated documentary and artefactual evidence, including photographs of bamboo products and production activities, workshop environments, promotional materials, exhibition records, and publicly available information concerning bamboo craft communities in Tasikmalaya. These materials were used to contextualize participants' accounts and provide additional evidence concerning product development, collaborative activities, and market engagement.

3.4.3 Iterative Data Collection and Data Adequacy

Data collection and preliminary interpretation proceeded iteratively. Emerging insights from earlier interviews and observations informed subsequent questioning and further exploration, allowing issues that appeared particularly relevant to the research questions to be examined in greater depth. The researchers continuously compared evidence from the three interviews, the FGD, field observations, and documentary materials to assess recurrence, convergence, and complementarity across sources.

Given the small and purposive sample, data adequacy was not determined solely through numerical saturation. Instead, adequacy was assessed in terms of information richness and conceptual convergence. After each stage of data collection, emerging concepts were reviewed and compared across participants and sources. Particular attention was given to recurring and complementary evidence concerning indigenous knowledge transmission, community-based learning, product innovation, market adaptation, knowledge protection, and digital technology use. Data collection was considered adequate when subsequent evidence primarily reinforced, elaborated, or contextualized concepts already identified rather than introducing substantially different conceptual categories.

This approach is consistent with the inductive orientation of the Gioia methodology, in which empirical material and emerging interpretations are examined iteratively to develop conceptually meaningful categories. The resulting dataset provided the empirical foundation for the subsequent Gioia coding and data-structure development.

3.4.4 Ethical Considerations

The study followed the ethical research procedures established by Universitas Bakti Tunas Husada. Before data collection, participants were informed about the study's objectives, procedures, voluntary nature of participation, intended academic use of the data, and their right to withdraw without consequence. Informed consent was obtained before the interviews and FGD were conducted. Participants were also informed that their personal information and research materials would be treated confidentially and used for research purposes.

Because the professional identities of the participating master craftsmen were relevant to understanding the local bamboo craft ecosystem, explicit permission was obtained from each participant to disclose their names and professional affiliations in the manuscript. Accordingly, H. Ade Suherman (CV. Atlas Duta Kriya), H. Mumus (Situ Beet), and H. Iwan (Rineka Karya Art) are identified with their permission. This disclosure was voluntary and distinct from consent to participate in the study. Quotations are presented only where relevant to the research questions and in accordance with the consent provided.

Table 2. Overview of Data Collection

Data Source	Primary Purpose	Empirical Output
Focus Group Discussion (FGD)	Explore shared perspectives and refine areas for subsequent inquiry	Collective accounts and preliminary areas of inquiry

Semi-structured interviews	Explore individual experiences, interpretations, and practices	Verbatim interview transcripts
Field observations	Examine craftsmanship and knowledge practices in their practical context	Observation notes and contextual descriptions
Documentary and artefactual evidence	Contextualize and complement participant accounts	Product photographs, workshop documentation, promotional materials, exhibition records, and related materials

Table 2 summarizes the complementary evidence generated through the data collection process. Rather than treating the different sources as interchangeable, the study used them to examine the phenomenon from different empirical angles. This strengthened the contextual richness of the dataset and supported systematic comparison during the subsequent analysis.

3.5 Data Analysis

The empirical material was analyzed using the Gioia Methodology, an inductive qualitative approach that supports systematic theory building while maintaining a clear connection between participants' accounts and higher-order conceptual interpretations (Gioia et al., 2013). Analysis proceeded iteratively alongside data collection, allowing emerging insights to inform subsequent questioning, observation, and comparison across the different sources of evidence.

The analysis followed the three-stage Gioia coding process, progressing from informant-centered first-order concepts to researcher-interpreted second-order themes and subsequently to aggregate dimensions (Gioia et al., 2013). First, interview transcripts, FGD materials, field notes, and documentary or artefactual evidence were examined to identify participant-centered expressions and experiences. These expressions were retained as first-order concepts, keeping the analysis close to the language and meanings expressed by the master bamboo craftsmen.

Second, conceptually related first-order concepts were compared and consolidated into second-order themes through iterative comparison and interpretive analysis. At this stage, the analysis moved from participants' specific expressions toward broader patterns that captured underlying knowledge processes. For example, learning-by-doing, experimentation, and accumulated production experience were examined as a potential pattern of experiential learning, while collaborative production, reciprocal learning, exhibitions, institutional interaction, and community mentoring were compared as evidence of collective knowledge sharing.

Third, the second-order themes were further integrated into six aggregate dimensions representing the broader conceptual structure emerging from the empirical material: Indigenous Knowledge Assets, Community Knowledge Ecosystem, Experiential Learning and

Knowledge Creation, Adaptive Innovation Capability, Knowledge Protection, and Sustainable Competitiveness.

Existing theoretical perspectives were not used as predetermined coding categories. Instead, the empirical structure was allowed to emerge inductively before being interpreted through the complementary lenses of the Knowledge-Based View, Community of Practice, and Dynamic Capabilities. Digital technology was likewise examined as an empirical phenomenon rather than imposed as a predefined explanatory category. This approach enabled the analysis to identify how digitally mediated resources were incorporated into indigenous knowledge practices while maintaining a distinction between participants' accounts and subsequent theoretical interpretation.

The analysis was conducted by a single primary researcher; consequently, intercoder agreement was not applicable. Interpretive ambiguities were addressed through repeated examination of the original material, constant comparison across participants and data sources, and iterative refinement of the coding structure. Member checking and formal peer debriefing were not conducted. Analytical credibility was instead supported through comparison across interviews, the FGD, field observations, and documentary or artefactual evidence, together with systematic coding in NVivo and documentation of the analytical progression from empirical material to higher-order concepts.

The overall research process is presented in Figure 2 in Section 3.1, while the empirical Gioia data structure and emergent aggregate dimensions are presented in Section 4.1.

4. FINDINGS

4.1 Gioia Data Structure and Emergent Dimensions

The Gioia analysis yielded approximately 70 first-order concepts from the three in-depth interviews, Focus Group Discussion (FGD), field observations, and documentary evidence. Through iterative comparison and refinement, these concepts were consolidated into 11 second-order themes and six aggregate dimensions. The resulting data structure captures interconnected processes through which indigenous knowledge is accumulated, shared, developed through experience, translated into innovation, protected from imitation, and ultimately reflected in sustainable competitiveness.

The analysis further indicates that participants' experiences cannot be understood as isolated aspects of craftsmanship. Instead, their accounts reveal an interconnected knowledge-management process in which inherited knowledge interacts with community learning, experiential practice, innovation, and knowledge protection. This pattern provides the empirical basis for understanding how bamboo craft MSMEs sustain and renew their knowledge resources while responding to changing market and technological conditions.

Figure 3 presents a representative excerpt of the Gioia data structure. Rather than reproducing the complete coding database, the figure illustrates selected analytical pathways linking participants' expressions to second-order themes and higher-order aggregate dimensions. The selected pathways highlight recurring and analytically significant patterns related to indigenous knowledge, community-based learning, experiential knowledge creation, adaptive innovation, knowledge protection, and sustainable competitiveness:

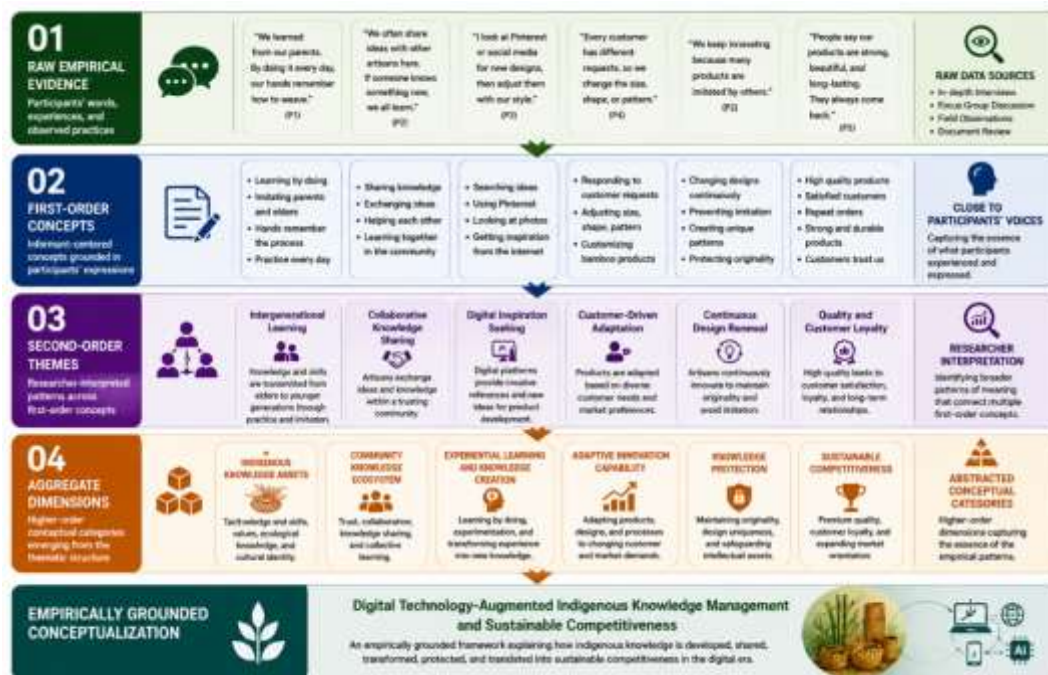


Figure 3. Gioia Data Structure Showing the Emergence of Aggregate Dimensions from Empirical Evidence

The six aggregate dimensions provide the empirical structure for the findings presented in the following subsections. Rather than representing strictly sequential stages, they describe interconnected processes through which indigenous knowledge is continuously developed and mobilized within the bamboo craft ecosystem. Indigenous Knowledge Assets provides the foundational knowledge resources from which the subsequent processes emerge. The following subsections examine each aggregate dimension and its constituent second-order themes in turn.

4.2 Indigenous Knowledge Assets

The first aggregate dimension, **Indigenous Knowledge Assets**, captures the knowledge resources embedded in bamboo craftsmanship and accumulated through sustained engagement with materials, production practices, local environments, and cultural traditions. The findings show that these assets encompass more than technical weaving skills; they include ecological understanding, experiential craftsmanship, aesthetic judgement, quality standards, product-making traditions, and culturally embedded values.

Rather than appearing as a fixed inheritance, indigenous knowledge emerged as a living resource that is continually enacted and refined through practice. Established techniques provide a foundation for craftsmanship, while experimentation, material exploration, and changing customer requirements create opportunities to extend inherited knowledge without severing its cultural and technical foundations.

4.2.1 Intergenerational Knowledge Transmission (Second-order Theme 1)

Participants described bamboo craftsmanship as knowledge acquired primarily through prolonged participation in family- and community-based production. Rather than relying on formal instruction alone, learning occurs through observation, imitation, guided practice, and gradual involvement in actual production activities.

This process encompasses more than the transmission of technical procedures. Participants described learning to recognize suitable bamboo materials, understand production sequences, maintain quality, and develop sensitivity to design and finishing through direct engagement with more experienced craftsmen.

Intergenerational transmission therefore provides continuity to indigenous craftsmanship while allowing knowledge to be reinterpreted through practice. Inherited practices serve as a foundation, but they are not transferred as an unchanged package; less experienced craftsmen encounter them through their own production experiences and adapt them to contemporary conditions.

4.2.2 Ecological Craftsmanship Knowledge (Second-order Theme 2)

Participants demonstrated extensive knowledge of bamboo as a natural material, including species characteristics, maturity, harvesting, drying, preservation, selection, and suitability for particular applications.

This knowledge reflects an experiential understanding of bamboo developed through long-term interaction with the material. Material selection was not treated merely as a technical production step but as a form of judgement that influences durability, appearance, processing quality, and the final character of each product.

Ecological craftsmanship knowledge therefore connects environmental understanding with production decision-making. Rather than treating bamboo as a standardized industrial input, artisans work according to variations in its physical characteristics, demonstrating how ecological knowledge is embedded directly in everyday craftsmanship.

4.2.3 Experiential Craftsmanship Knowledge (Second-order Theme 3)

Participants emphasized that advanced craftsmanship develops through prolonged practice and accumulated production experience. Technical proficiency cannot be fully acquired through formal instruction alone because many production decisions depend on tacit judgement developed through repeated encounters with materials, techniques, and production problems. This finding is consistent with Polanyi's (1966) view of tacit knowledge as a form of knowing that is embedded in practical experience and cannot be fully articulated through explicit rules or instructions.

This experiential knowledge includes recognizing material imperfections, adjusting techniques, anticipating production difficulties, selecting appropriate finishing methods, and determining whether a product meets expected quality standards. Such judgements are

developed through repeated practice and direct engagement with production rather than through explicit instruction alone. In this sense, craftsmanship involves not only knowing formal production procedures but also knowing how to respond appropriately to particular materials, situations, and emerging production problems.

Experiential craftsmanship knowledge therefore represents a tacit dimension of indigenous expertise that remains difficult to fully codify. Consistent with Polanyi's (1966) perspective, its development depends on sustained practical engagement in which artisans progressively refine their ability to perceive, judge, and act based on accumulated experience. Within the bamboo craft context, this tacit knowledge constitutes an important source of distinctive craftsmanship capability because it is embedded in embodied practice and cannot be readily reproduced through written procedures alone.

4.2.4 Knowledge as a Strategic Organizational Resource (Second-order Theme

4)

Beyond its role in cultural continuity and production, participants described knowledge as a resource for maintaining business development and continuity. Accumulated knowledge enables craftsmen to identify weaknesses, evaluate existing products, generate new ideas, and respond to changing production and market conditions.

Participants explained that product development often begins with existing knowledge that allows them to assess current products, identify opportunities for improvement, and experiment with alternative designs while retaining the underlying principles of bamboo craftsmanship.

These accounts indicate that indigenous knowledge acquires strategic significance when it is mobilized for problem-solving, learning, and product development. Its value therefore lies not only in preservation but also in its capacity to be activated, evaluated, and renewed through ongoing practice.

Taken together, the four second-order themes establish Indigenous Knowledge Assets as a multidimensional foundation of bamboo craftsmanship. Intergenerational transmission provides continuity; ecological knowledge informs interaction with bamboo materials; experiential craftsmanship develops tacit production capability; and the strategic mobilization of knowledge enables artisans to apply these accumulated resources to improvement and product development.

These themes are interconnected rather than separate repositories of knowledge. Knowledge transmitted across generations is refined through practical experience, ecological understanding informs production judgement, and accumulated expertise provides the basis for evaluating and developing products. The aggregate dimension therefore reflects a living knowledge base whose value emerges through continued use and renewal.

At the same time, the findings indicate that these knowledge assets do not develop solely within the individual artisan. Participants' accounts show that their knowledge is continually enriched through interactions with fellow craftsmen, institutions, exhibitions, customers, and broader professional networks. This provides the empirical transition to the Community Knowledge Ecosystem, which examines how individually embedded knowledge becomes collectively accessible, exchanged, and enriched through social and institutional interaction.

4.3 Community Knowledge Ecosystem

The second aggregate dimension, Community Knowledge Ecosystem, explains how indigenous knowledge extends beyond individual craftsmen and develops through interaction within a broader social and institutional environment. Participants described learning and knowledge exchange involving fellow artisans, universities, government agencies, exhibitions, customers, suppliers, and professional networks.

4.3.1 Collaborative Knowledge Sharing (Second-order Theme 1)

Participants described regular interaction among craftsmen as an important source of knowledge exchange. Rather than treating other craftsmen exclusively as competitors, participants reported sharing production experiences, discussing market developments, exchanging technical ideas, and assisting one another in addressing production challenges.

As H. Iwan from Rineka Karya Art explained:

“Competitors are also our partners. We complement each other, share knowledge, and even maintain mutual agreements regarding market prices.”

This pattern reflects coopetition, in which competition and collaboration coexist within the artisan community. Knowledge sharing therefore supports collective learning while allowing individual craftsmen to maintain their own business activities.

4.3.2 Institutional Collaboration (Second-order Theme 2)

Participants also identified universities, government agencies, exhibitions, and professional programs as important sources of external knowledge and exposure. These interactions introduced new perspectives concerning product development, design, market opportunities, and organizational practices.

H. Ade described how interactions with external institutions provided information that could subsequently be transformed into new products:

“I received invitations from ITB alumni and various institutions. Those interactions gave me new information that I later transformed into products.”

Institutional collaboration therefore broadens the knowledge resources available to craftsmen while allowing external information to be interpreted through existing indigenous expertise.

4.3.3 Knowledge Networking and Collective Learning (Second-order Theme 3)

Knowledge development also extended beyond the immediate local community through exhibitions, interregional visits, government programs, and interactions with craftsmen from other regions. Participants described learning from practitioners outside Tasikmalaya and using exhibitions as opportunities to observe new designs, production practices, and market developments.

The findings further indicate an intergenerational dimension to knowledge networking. Sharing experiences with younger craftsmen and students was described as part of maintaining the continuity of bamboo craftsmanship. These networks expand the geographical and social boundaries of learning while supporting the circulation of indigenous knowledge across communities and generations.

4.3.4 Collective Knowledge Governance (Second-order Theme 4)

Participants also described informal norms governing relationships among craftsmen, including mutual trust, price agreements, respect for market relationships, and shared expectations regarding fair competition.

Such practices help prevent destructive competition and support stable relationships within the artisan community. Collective knowledge governance therefore provides a social foundation for sustained interaction by establishing norms of reciprocity, trust, and collective responsibility.

The four themes demonstrate that the Community Knowledge Ecosystem provides the social and institutional conditions through which individually embedded knowledge becomes accessible to a wider network of actors. Collaborative knowledge sharing facilitates horizontal exchange, institutional collaboration introduces external perspectives, professional networking broadens learning opportunities, and informal governance supports the trust required for continued interaction.

These processes primarily expand access to knowledge rather than constitute innovation themselves. The knowledge and perspectives obtained through these interactions acquire practical value when artisans interpret and apply them through production experience. This provides the empirical transition to Experiential Learning and Knowledge Creation, which explains how accessed knowledge is transformed through practice, experimentation, and reflection.

4.4 Experiential Learning and Knowledge Creation

The third aggregate dimension, Experiential Learning and Knowledge Creation, captures how knowledge obtained through indigenous practice and community interaction is converted into new understanding through direct experience. Participants emphasized that learning occurs through production, experimentation, customer interaction, and reflection on previous outcomes.

4.4.1 Learning by Doing (Second-order Theme 1)

Participants described practical experience as a primary source of craftsmanship development. Skills were progressively developed through repeated production, experimentation, and direct involvement in manufacturing activities.

A craftsman from Rineka Karya Art explained:

“Training only strengthens what already exists. The strongest knowledge comes from experience.”

This evidence indicates that experiential learning enables tacit knowledge to develop through repeated engagement with production problems and material characteristics.

4.4.2 Market-Based Learning (Second-order Theme 2)

Customer requests, feedback, and changing market preferences were also described as sources of new knowledge. Participants explained that customer needs frequently stimulate ideas for modifying or developing products.

H. Ade explained:

“We first understand what customers want, then we transform those ideas into products.”

Market interaction therefore provides information that is interpreted through existing craftsmanship and used to guide product development.

4.4.3 Reflective Knowledge Creation (Second-order Theme 3)

Participants described learning from production difficulties, product weaknesses, customer complaints, and previous outcomes. Reflection on these experiences enabled craftsmen to reconsider designs and production practices.

Rather than simply repeating established procedures, artisans used previous experience as a basis for identifying improvements. This process converts practical experience into new production knowledge and supports continuous creative development.

Experiential Learning and Knowledge Creation therefore represents the mechanism through which accumulated and newly accessed knowledge becomes actionable. Practice provides direct experience, market interaction introduces new information, and reflection converts experience into improved knowledge.

This process provides the foundation for Adaptive Innovation Capability, as newly developed knowledge becomes meaningful when it is translated into products, designs, and production approaches that respond to changing market conditions.

4.5 Adaptive Innovation Capability

The fourth aggregate dimension concerns the ability of bamboo craft MSMEs to translate accumulated and newly developed knowledge into commercially relevant innovation. Participants generally described innovation as adaptive and incremental, involving modifications in product function, design, materials, and presentation rather than radical technological disruption.

4.5.1 Product Diversification (Second-order Theme 1)

Participants described extending bamboo products beyond conventional household applications into decorative lighting, hospitality interiors, furniture accessories, souvenirs, and contemporary handicrafts.

This diversification demonstrates how established craftsmanship can be applied to new product functions and market segments while retaining core production knowledge.

4.5.2 Digital Technology-Augmented Creativity (Second-order Theme 2)

Digital technologies appeared primarily as complementary resources for accessing design references and market information. Participants mentioned Pinterest, social media, online images, and other digital platforms as sources of inspiration and market observation.

As one participant explained:

“We look at Pinterest, study the designs, and then modify them according to our own identity.”

The significance of these technologies lies not in replacing craftsmanship but in expanding the range of external references available to artisans. Digital resources are selectively interpreted through existing knowledge and adapted to local craftsmanship.

4.5.3 Knowledge Transformation (Second-order Theme 3)

H. Ade repeatedly emphasized that external information becomes valuable when it is transformed into original products rather than copied directly:

“We transform the information into products that reflect our own creativity.”

Knowledge transformation therefore represents the interpretive process through which external references become locally meaningful products.

Adaptive Innovation Capability emerges from the interaction of product diversification, digitally augmented creative exploration, and knowledge transformation. Together, these processes allow craftsmen to respond to changing market conditions while retaining the distinctive foundations of bamboo craftsmanship.

However, increased product development and exposure to external references also create risks of imitation. This makes Knowledge Protection an important complementary capability.

4.6 Knowledge Protection

The fifth aggregate dimension, Knowledge Protection, concerns the practices through which craftsmen preserve product distinctiveness and protect culturally embedded knowledge from imitation.

4.6.1 Continuous Design Renewal (Second-order Theme 1)

Participants described continuously modifying product designs in response to the rapid imitation of successful products.

As H. Iwan explained:

“We keep changing our designs because many products are quickly copied.”

Design renewal therefore functions as a practical mechanism for maintaining differentiation in a market where formal protection mechanisms may be difficult to apply.

4.6.2 Authenticity Protection (Second-order Theme 2)

Participants emphasized distinctive weaving techniques, motifs, material quality, finishing, and craftsmanship characteristics as important elements of product authenticity.

Authenticity extends beyond visible appearance because some of the most distinctive characteristics are embedded in tacit production knowledge and accumulated craftsmanship experience.

4.6.3 Cultural Identity Preservation (Second-order Theme 3)

Participants also emphasized the importance of maintaining the cultural identity embedded in bamboo craftsmanship. Product adaptation and innovation were not viewed as requiring the abandonment of local identity. Instead, artisans sought to incorporate new ideas while retaining recognizable characteristics associated with local craftsmanship.

This suggests that knowledge protection is not limited to preventing imitation. It also involves preserving the cultural meaning and identity that distinguish indigenous craftsmanship while allowing products to evolve.

Knowledge Protection therefore operates through design renewal, preservation of authentic craftsmanship, and maintenance of cultural identity. These mechanisms enable artisans to innovate without losing the distinctive characteristics that underpin their market differentiation.

The protected and differentiated value created through these processes becomes visible at the market level through Sustainable Competitiveness, the sixth aggregate dimension.

4.7 Sustainable Competitiveness

The sixth aggregate dimension, Sustainable Competitiveness, captures the market-level outcomes associated with the preceding knowledge processes. Participants linked sustained competitiveness to three complementary outcomes: premium quality, enduring customer relationships, and the ability to reach broader markets.

4.7.1 Premium Quality (Second-order Theme 1)

Participants associated product quality with careful bamboo selection, craftsmanship precision, durability, finishing, and attention to production details. High-quality materials and careful production practices were viewed as important factors distinguishing their products from competitors.

Premium quality therefore represents a tangible market expression of accumulated craftsmanship expertise and enables artisans to differentiate their products without relying primarily on price competition.

4.7.2 Customer Loyalty (Second-order Theme 2)

Participants associated sustained customer relationships with consistent quality and distinctive craftsmanship. Repeat purchases, recommendations, and continued relationships were described as indicators that customers recognized and valued these characteristics. Customer loyalty consequently reflects the ability to convert perceived product value into enduring market relationships based on trust, consistency, and distinctiveness.

4.7.3 Global Market Orientation (Second-order Theme 3)

Participants described supplying products to hospitality businesses, serving customers beyond Tasikmalaya, and accessing international or export-oriented markets. These experiences indicate that broader market engagement requires artisans to adapt product forms, functions, and presentation to diverse customer requirements while retaining the distinctive principles of bamboo craftsmanship.

Rather than abandoning indigenous craftsmanship to accommodate external expectations, artisans selectively modify their products while preserving the characteristics that distinguish their work. Global market orientation therefore reflects the capacity to reconcile cultural distinctiveness with market responsiveness across diverse commercial contexts.

Taken together, Premium Quality, Customer Loyalty, and Global Market Orientation represent complementary manifestations of Sustainable Competitiveness. Premium quality reflects value embodied in accumulated craftsmanship, customer loyalty reflects the ability to sustain that value through enduring market relationships, and global market orientation reflects the capacity to extend such value across broader commercial contexts.

Sustainable Competitiveness should not, however, be understood as a static endpoint. Changing customer expectations and competitive pressures can stimulate further learning, adaptation, and knowledge renewal, creating feedback into the knowledge processes that underpin competitiveness. The findings therefore position sustainable competitiveness as both an outcome of accumulated knowledge processes and a condition that encourages their continued renewal.

Building on these relationships, the six aggregate dimensions are synthesized as interconnected processes through which indigenous knowledge is developed, collectively enriched, transformed through experience, mobilized for innovation, protected, and translated into sustainable competitiveness. Digital technology operates transversally across these processes as an augmentation layer, expanding access to external knowledge, creative resources, market intelligence, and communication opportunities without displacing the experiential and culturally embedded foundations of craftsmanship.

4.7.4 Synthesis and Transition to the Conceptual Framework

Taken together, Premium Quality, Customer Loyalty, and Global Market Orientation represent complementary manifestations of Sustainable Competitiveness. Premium quality reflects value embodied in accumulated craftsmanship and material quality, customer loyalty reflects the ability to sustain such value through enduring market relationships, and global market orientation reflects the capacity to extend such value across broader commercial contexts.

Sustainable Competitiveness should not, however, be understood as a static endpoint. The findings indicate that changing customer expectations and competitive pressures can stimulate further learning, adaptation, and knowledge renewal. Competitiveness therefore emerges both from the preceding knowledge processes and from the continued capacity of artisans to renew these processes.

Building on these empirical relationships, the six aggregate dimensions identified through the Gioia analysis are synthesized into a preliminary conceptual framework. They are conceptualized as interconnected processes through which indigenous knowledge is developed, collectively enriched, transformed through experience, mobilized for innovation, protected, and translated into sustainable competitiveness. Digital technology operates transversally across these processes as an augmentation layer, expanding access to external knowledge, creative resources, market intelligence, and communication opportunities without displacing the experiential and culturally embedded foundations of craftsmanship.

Figure 4 presents the resulting empirically grounded conceptual framework, termed the Digital Technology-Augmented Indigenous Knowledge Management Cycle (DT-IKMC):



Figure 4. Digital Technology-Augmented Indigenous Knowledge Management Cycle (DT-IKMC): An Empirically Grounded Conceptual Framework for Sustainable Competitiveness among Bamboo Craft MSMEs in Tasikmalaya, Indonesia.

As illustrated in Figure 4, the DT-IKMC conceptualizes Sustainable Competitiveness as an emergent outcome of interconnected knowledge processes rather than as the product of a single capability. Indigenous Knowledge Assets provide the foundational resource, while the Community Knowledge Ecosystem enables knowledge to circulate through interactions among artisans, communities, institutions, customers, and external networks. Experiential Learning and Knowledge Creation transform accumulated and newly accessed knowledge through practice, experimentation, and reflection, supporting Adaptive Innovation Capability. Knowledge Protection helps preserve the distinctiveness and cultural integrity generated through these processes, while Sustainable Competitiveness represents their market-level expression.

Digital technology is positioned transversally across the DT-IKMC rather than as a separate stage of the knowledge process. Digital platforms and AI-enabled digital technologies expand artisans' access to creative references, market intelligence, external knowledge, and communication opportunities across the cycle. These resources are selectively interpreted, adapted, and transformed through experiential craftsmanship and culturally embedded knowledge. Thus, digital technology functions as an augmentation mechanism that strengthens indigenous knowledge management while preserving indigenous expertise, cultural identity, and human judgement as the foundation of innovation and sustainable competitiveness.

The framework is therefore presented as a preliminary, empirically grounded conceptualization rather than a fully validated causal model. Its contribution lies in explaining how culturally embedded knowledge and digitally mediated resources may interact to support the continued renewal and sustainable competitiveness of bamboo craft MSMEs.

5. DISCUSSION

5.1 Indigenous Knowledge as a Dynamic Strategic Resource

The findings demonstrate that indigenous knowledge among bamboo craft MSMEs is not simply a repository of inherited techniques but a dynamic strategic resource that is continuously renewed through practice, interaction, and adaptation. The six aggregate dimensions identified through the Gioia analysis indicate that knowledge embedded in craftsmanship acquires strategic value when it can be accessed, collectively enriched, transformed through experience, mobilized for innovation, protected from erosion or imitation, and translated into sustained market value.

This finding extends the Knowledge-Based View by demonstrating how the strategic value of knowledge in culturally embedded MSMEs depends not only on its possession but also on the organizational and social processes through which it is activated. In the present context, ecological understanding, tacit craftsmanship, aesthetic judgement, production experience, and culturally embedded knowledge constitute resources that are difficult to reproduce because they have developed through prolonged interaction with materials, communities, and local production environments. Their value therefore lies partly in their accumulated and context-dependent character.

The findings further suggest that indigenous knowledge should not be conceptualized as static cultural heritage. Intergenerational transmission provides continuity, but continuity does not imply replication. Knowledge is repeatedly reinterpreted through experimentation, changing customer requirements, material exploration, and practical problem-solving. This dynamic character is important because it explains how traditional craft practices can remain relevant under changing competitive conditions without losing their cultural foundations. From a strategic perspective, therefore, the competitiveness of bamboo craft MSMEs does not arise simply from possessing traditional knowledge. Rather, it emerges from the capacity to renew, mobilize, and protect knowledge while maintaining its distinctive cultural and experiential foundations. This distinction strengthens the connection between indigenous knowledge management and sustainable competitiveness.

5.2 Community Knowledge Ecosystems as the Social Infrastructure of Indigenous Knowledge Management

A second important finding concerns the role of the Community Knowledge Ecosystem in transforming individually embedded knowledge into a collectively accessible resource. The empirical evidence indicates that knowledge circulates through informal peer exchange, family-based learning, institutional interaction, exhibitions, professional networks, customer relationships, and community-based collaboration.

This finding is consistent with the Community of Practice perspective, particularly its emphasis on learning through participation and social interaction. However, the present findings extend this perspective by showing that the relevant community extends beyond a bounded group of artisans. Knowledge may enter the craft ecosystem through interactions with institutions, customers, market actors, exhibitions, and digitally mediated networks. The community therefore functions not merely as a site for transmitting existing knowledge but as a broader knowledge environment in which internal and external sources of knowledge can meet.

Importantly, community interaction does not automatically produce innovation. The empirical findings suggest a distinction between knowledge access and knowledge transformation. Community networks create opportunities for artisans to encounter ideas, techniques, market information, and alternative perspectives, but these resources acquire practical value only when they are interpreted through accumulated craftsmanship and applied in specific production contexts.

This distinction helps explain the relationship between the Community Knowledge Ecosystem and the subsequent dimension of Experiential Learning and Knowledge Creation. Social interaction expands the pool of accessible knowledge, while experiential engagement determines how that knowledge is understood, tested, adapted, and incorporated into practice. The contribution of the community ecosystem therefore lies in creating the conditions under which indigenous knowledge can remain socially connected and continually enriched.

5.3 Experiential Learning and Knowledge Creation as the Mechanism of Knowledge Renewal

The findings show that experiential learning provides a central mechanism through which accumulated knowledge is transformed into new practical understanding. Participants emphasized learning-by-doing, experimentation, repeated problem-solving, and direct engagement with bamboo materials. Such processes enable artisans to refine inherited practices while generating new solutions to production, design, and market challenges.

This finding reinforces the importance of tacit knowledge in craft-based industries. Unlike codified knowledge, much of the expertise required for high-quality bamboo craftsmanship is embedded in judgement developed through repeated practice. Artisans learn to recognize material imperfections, anticipate production difficulties, determine appropriate finishing methods, and adjust techniques according to the characteristics of individual bamboo materials. Such capabilities cannot be fully captured through formal instructions alone.

The findings also reveal that experiential learning serves as a bridge between knowledge continuity and innovation. Traditional knowledge provides a starting point, while experimentation creates opportunities for modification and renewal. Innovation therefore does not necessarily require the abandonment of indigenous knowledge. Instead, it may emerge through the reinterpretation of existing knowledge in response to new materials, customer requirements, design references, and market conditions.

This finding provides an important qualification to conventional interpretations of innovation in traditional industries. Innovation in this context is not necessarily synonymous with technological disruption. It can be incremental, experiential, and culturally embedded, with new products and practices emerging from the continuous interaction between inherited knowledge and contemporary challenges.

5.4 Adaptive Innovation Capability and the Role of Dynamic Capabilities

The fourth aggregate dimension, Adaptive Innovation Capability, demonstrates how bamboo craft MSMEs respond to changing market and technological environments while retaining their distinctive foundations. Participants described modifying product designs, combining bamboo with other materials, responding to customer requirements, developing contemporary product forms, and selectively incorporating external references.

These findings resonate with the Dynamic Capabilities perspective, particularly the capacity of firms to adapt resources and practices in changing environments. However, the empirical evidence suggests that adaptation in traditional craft industries differs from technology-centered models of organizational transformation. Adaptation does not necessarily involve replacing existing capabilities with new ones. Instead, it often involves reconfiguring existing indigenous knowledge in response to new opportunities and constraints.

The distinction between preservation and adaptation is therefore critical. Preserving indigenous knowledge does not mean maintaining every existing practice unchanged. Conversely, adaptation does not necessarily imply cultural dilution. The artisans in this study appear to negotiate these two demands by selectively modifying designs, materials, functions, and presentation while retaining underlying craftsmanship principles and cultural identity. Adaptive innovation can thus be understood as a capability for selective transformation. It allows artisans to respond to external changes without surrendering the knowledge base that differentiates their products. This provides a more nuanced understanding of how dynamic capabilities may operate in culturally embedded MSMEs.

5.5 Digital Technology as an Augmentation Mechanism, Not a Substitute for Indigenous Knowledge

One of the central contributions of this study concerns the positioning of digital technology within indigenous knowledge management. The findings indicate that digital platforms and AI-enabled digital technologies provide access to creative references, market intelligence, external knowledge, and communication opportunities. However, these technologies do not independently generate the indigenous knowledge that underpins bamboo craftsmanship.

Digital technology is therefore positioned transversally across the DT-IKMC rather than as a separate stage of the knowledge process. Its contribution lies in expanding the knowledge environment within which artisans search for references, identify market trends, communicate with customers, and encounter external ideas. The resulting resources remain subject to artisans' interpretation, selection, adaptation, and transformation.

This distinction is particularly important for understanding the role of Artificial Intelligence. The empirical evidence does not support treating AI as an independent knowledge-management framework or as the principal driver of innovation. Rather, AI is appropriately understood as one form of AI-enabled digital technology within the broader digital technology augmentation layer. Its potential contribution lies in supporting activities such as creative exploration, design assistance, storytelling, or market intelligence, while the meaning and applicability of its outputs remain dependent on human judgement and indigenous expertise.

The findings consequently challenge a technology-substitution interpretation of digital transformation in traditional creative industries. Digital technology does not replace the experiential knowledge accumulated by artisans. Instead, it can broaden the range of resources available for knowledge renewal. The strategic value of digital technology therefore depends on the capacity of artisans to integrate external resources with culturally embedded knowledge. This finding also explains why the study conceptualizes digital technology as an augmentation mechanism rather than an additional aggregate dimension. The six aggregate dimensions describe the empirical knowledge-management processes that emerged from the data, whereas

digital technology cuts across these processes by expanding access to resources that may enter the knowledge cycle. This distinction is central to the conceptual logic of the DT-IKMC.

5.6 Knowledge Protection and the Preservation of Distinctive Craft Value

The findings further demonstrate that knowledge protection constitutes an important condition for sustainable competitiveness. Participants described concerns regarding product imitation and the need to maintain distinctive designs, production approaches, and accumulated craftsmanship expertise. Protection in this context extends beyond formal intellectual property mechanisms and includes practical strategies for maintaining the distinctiveness of products and preserving knowledge embedded in craft practices.

This finding adds an important dimension to knowledge-based interpretations of competitiveness. Knowledge creates strategic value when it is not only developed and mobilized but also protected from uncontrolled replication or erosion. In craft industries, however, knowledge protection must be understood within the realities of tacit and socially transmitted knowledge. Some knowledge is embedded in practice and therefore difficult to codify, while other aspects can be observed or imitated through finished products.

The findings suggest that knowledge protection is consequently intertwined with innovation. Continuous development of designs, product configurations, finishing techniques, and applications can make it more difficult for competitors to reproduce the complete knowledge base underlying distinctive products. Protection thus does not necessarily mean restricting knowledge circulation; rather, it may involve maintaining the distinctive combination of knowledge, experience, judgement, and cultural interpretation that gives products their identity.

5.7 Sustainable Competitiveness as an Emergent and Recursive Outcome

The findings conceptualize Sustainable Competitiveness through three complementary manifestations: Premium Quality, Customer Loyalty, and Global Market Orientation. Together, these outcomes demonstrate that competitiveness in bamboo craft MSMEs is not reducible to short-term sales or product novelty. Instead, it reflects the ability to preserve distinctive value, sustain market relationships, and extend that value into broader commercial contexts.

This finding is significant because it connects the preceding knowledge-management processes to observable market-level outcomes. Premium quality reflects the translation of accumulated craftsmanship into product value; customer loyalty indicates the capacity to sustain that value through enduring relationships; and broader market orientation demonstrates the ability to adapt and extend value across different market contexts.

At the same time, Sustainable Competitiveness should not be interpreted as a terminal endpoint. Market feedback can generate new demands for product adaptation, learning, and knowledge renewal. Customer expectations may stimulate experimentation, competitive pressure may encourage innovation, and broader market exposure may introduce new knowledge and design references. Sustainable competitiveness therefore has a recursive character: it emerges from knowledge processes while simultaneously creating conditions that stimulate their continued renewal.

This recursive interpretation provides the conceptual rationale for representing the framework as a cycle rather than a linear input-output model. The cycle does not imply that

every artisan follows an identical sequence. Instead, it represents the continuing interaction through which knowledge resources, social learning, experiential transformation, innovation, protection, and market outcomes influence one another over time.

5.8 Theoretical Contribution of the DT-IKMC

The principal theoretical contribution of this study is the development of the Digital Technology-Augmented Indigenous Knowledge Management Cycle (DT-IKMC) as a preliminary conceptual framework for understanding sustainable competitiveness in culturally embedded creative MSMEs.

The framework contributes to existing perspectives in three interconnected ways. First, it extends the Knowledge-Based View by demonstrating that indigenous knowledge can function as a strategic resource when it is continuously renewed, mobilized, and protected rather than merely preserved. Second, it extends the Community of Practice perspective by emphasizing that knowledge circulation occurs across a broader ecosystem involving artisans, communities, institutions, customers, and external networks. Third, it complements the Dynamic Capabilities perspective by showing that adaptation in traditional craft industries may involve selective transformation of indigenous knowledge rather than wholesale replacement of existing capabilities.

The framework additionally introduces digital technology as a transversal augmentation layer connecting the indigenous knowledge system with external digital resources. This positioning provides a conceptual bridge between indigenous knowledge management and digital transformation without assuming that technological adoption automatically produces innovation or competitiveness.

The DT-IKMC therefore differs from a conventional technology-centric model in which digital technologies constitute independent capabilities or direct antecedents of performance. Instead, the framework proposes that digital resources become strategically meaningful through their interaction with indigenous knowledge, experiential craftsmanship, human judgement, and culturally embedded practices. In this sense, the framework shifts attention from technology adoption to knowledge augmentation.

5.9 Toward a Contextualized Understanding of Digital Transformation in Indigenous Creative Industries

Taken together, the findings suggest that digital transformation in indigenous creative industries should be understood as a process of selective knowledge augmentation rather than technological substitution. The relevance of digital technology depends on the knowledge environment into which it is introduced and the capacity of practitioners to interpret external resources according to local cultural, material, and experiential conditions.

This perspective has broader implications beyond bamboo craft. Indigenous and culturally embedded creative industries often possess knowledge resources that cannot be fully digitized or replaced by algorithmic systems because they are rooted in tacit experience, material sensitivity, cultural meaning, and community-based learning. Digital technologies may nevertheless strengthen these systems when they expand access to otherwise distant knowledge and market resources.

The DT-IKMC therefore provides an initial conceptual bridge between indigenous knowledge management and digital technological change. Its broader relevance lies not in

assuming universal applicability, but in offering a framework for examining how traditional knowledge systems can remain adaptive and economically viable while retaining cultural integrity in increasingly digital environments.

5.10 Research Implications

The findings have implications for researchers, policymakers, universities, and bamboo craft MSMEs. For researchers, the DT-IKMC provides a basis for examining the interaction between indigenous knowledge, community learning, adaptive innovation, and digital technology in other culturally embedded industries. For policymakers, the findings suggest that digitalization programs for traditional creative industries should not focus exclusively on technology access but should also strengthen knowledge transmission, artisan networks, skills development, and cultural preservation.

Universities may contribute by facilitating knowledge exchange between artisans, designers, technology specialists, and students while respecting the ownership and cultural significance of indigenous knowledge. For MSMEs, the findings suggest that digital technology is most valuable when used selectively to expand creative and market possibilities while retaining craftsmanship expertise as the core source of differentiation.

These implications should nevertheless be interpreted within the boundaries of the present study. The DT-IKMC is derived from a small, purposive sample of master bamboo craftsmen in one regional context and therefore represents an empirically grounded starting point rather than a universally validated model.

6. CONCLUSION

This study explored how indigenous knowledge management contributes to sustainable competitiveness among bamboo craft MSMEs in Tasikmalaya, Indonesia, within a changing digital technological environment. Using an interpretive qualitative design and the Gioia methodology, the study identified six interconnected aggregate dimensions: Indigenous Knowledge Assets, Community Knowledge Ecosystem, Experiential Learning and Knowledge Creation, Adaptive Innovation Capability, Knowledge Protection, and Sustainable Competitiveness. The findings demonstrate that indigenous knowledge is not a static repository of inherited practices, but a living and strategically relevant resource that is continuously developed through intergenerational transmission, social interaction, experiential learning, innovation, and protection.

The study further shows that sustainable competitiveness emerges from the interaction among these knowledge processes rather than from a single organizational capability. Accumulated craftsmanship and ecological knowledge provide the foundational resource; community interaction enables knowledge to circulate and become collectively enriched; experiential learning transforms accumulated and newly accessed knowledge through practice and experimentation; adaptive innovation translates knowledge into evolving products and practices; and knowledge protection helps preserve the distinctiveness and cultural integrity of craft production. These processes are ultimately expressed through premium quality, enduring customer relationships, and broader market orientation.

A central conceptual insight concerns the role of digital technology within this knowledge system. The findings do not support positioning digital technology as a replacement for

indigenous knowledge or traditional craftsmanship. Instead, digital platforms and AI-enabled digital technologies, including emerging forms of generative AI and AI-assisted creative applications, function as an augmentation layer that expands artisans' access to creative references, external knowledge, market intelligence, and communication opportunities. The value of these resources, however, depends on artisans' ability to selectively interpret, adapt, and transform them through experiential craftsmanship, cultural knowledge, and human judgement. Digital technology therefore expands the knowledge environment surrounding bamboo craft MSMEs without displacing the culturally embedded foundations of craftsmanship.

The principal conceptual contribution of the study is the Digital Technology-Augmented Indigenous Knowledge Management Cycle (DT-IKMC). The framework synthesizes the six empirically derived aggregate dimensions into an interconnected conceptualization of how indigenous knowledge is developed, shared, transformed, protected, and translated into sustainable competitiveness, while digital technology operates transversally across these processes as an augmentation mechanism. DT-IKMC therefore provides an empirically grounded conceptual bridge between indigenous knowledge management and digitally mediated knowledge resources in traditional creative industries.

The study contributes to the Knowledge-Based View, Community of Practice, and Dynamic Capabilities perspectives by demonstrating how indigenous knowledge can simultaneously function as a strategic knowledge resource, a socially embedded collective capability, and a basis for adaptive renewal. Rather than proposing a universal causal model, the study extends these perspectives by showing how culturally embedded knowledge and digital technological resources can coexist within a knowledge-management process in which human expertise remains central. In this respect, DT-IKMC should be understood as a preliminary conceptual framework grounded in the empirical context of bamboo craft MSMEs in Tasikmalaya, rather than as a fully validated theory.

6.1 Research Limitations

Several limitations should be considered when interpreting the findings and the proposed DT-IKMC framework.

First, the study was conducted within the specific cultural, ecological, institutional, and market context of bamboo craft MSMEs in Tasikmalaya, Indonesia. This contextual specificity provides the depth necessary for understanding indigenous knowledge practices but also limits the direct transferability of the findings to other creative industries or geographical settings. The extent to which the identified dimensions operate similarly in other culturally embedded industries therefore remains an empirical question.

Second, the study employed an interpretive qualitative design and the Gioia methodology to generate an empirically grounded conceptual framework. This approach was appropriate for examining participants' experiences and identifying emerging knowledge processes, but it does not establish statistical relationships, causal effects, or predictive validity among the six aggregate dimensions. Accordingly, the relationships represented in DT-IKMC should be interpreted as conceptual relationships derived from qualitative evidence rather than empirically validated causal pathways.

Third, the empirical evidence was primarily derived from three purposively selected master bamboo craftsmen, supported by a Focus Group Discussion, field observations, and

documentary evidence. The participants were selected because of their substantial experiential knowledge and distinctive positions within the bamboo craft ecosystem. Nevertheless, the relatively small and specialized participant group means that the framework does not represent the full diversity of bamboo craft MSMEs, including less-established artisans, younger practitioners, employees, or other actors within the broader value chain.

Fourth, the study examined digital technology as it was experienced and used within the empirical setting during the research period. The digital resources identified in the study included digital platforms, social media, online marketplaces, digital images, and AI-enabled digital technologies. Because digital technologies continue to evolve rapidly, particularly AI-enabled applications, future technological developments may create forms of digitally augmented knowledge work that were not captured by the present study. The findings should therefore not be interpreted as an exhaustive account of all possible forms of digital technology augmentation.

Finally, the analysis was conducted by a single primary researcher. Although analytical credibility was strengthened through comparison across interviews, the FGD, observations, and documentary evidence, as well as systematic coding and iterative examination of the data, the study did not employ intercoder comparison, formal peer debriefing, or member checking. The resulting conceptualization should therefore be understood within the methodological boundaries of an interpretive, single-researcher qualitative study.

6.2 Future Research

Future research should first examine the transferability and boundary conditions of DT-IKMC across other culturally embedded creative industries, such as batik, wood carving, traditional textiles, ceramics, and other craft-based MSMEs. Comparative research across regions and cultural contexts could determine which dimensions represent broader mechanisms of indigenous knowledge management and which are particularly shaped by the bamboo craft ecosystem of Tasikmalaya.

Second, subsequent studies should empirically examine the relationships proposed within DT-IKMC using larger and more diverse samples. Quantitative approaches, including Structural Equation Modeling (SEM) or Partial Least Squares Structural Equation Modeling (PLS-SEM), could be used to assess relationships among indigenous knowledge assets, community knowledge processes, experiential learning, adaptive innovation, knowledge protection, digital technology augmentation, and sustainable competitiveness. Longitudinal studies would be particularly valuable for examining whether these processes reinforce one another over time and how sustainable competitiveness subsequently stimulates further knowledge renewal.

Third, future research should investigate the specific mechanisms through which AI-enabled digital technologies augment indigenous knowledge management. Rather than treating AI as a separate framework or independent replacement for craftsmanship, future studies could examine how particular applications—such as generative AI, AI-assisted design, AI-supported storytelling, computer vision, or AI-based market intelligence—affect the ways artisans search for, interpret, adapt, and transform external knowledge. An important question is whether increasing technological sophistication continues to strengthen human craftsmanship or begins to alter the balance between technological assistance and culturally embedded expertise.

Fourth, future research should examine the dynamic relationship between digital augmentation and indigenous knowledge protection. Greater digital access may expand opportunities for creativity and market reach, but it may also increase exposure to imitation, unauthorized reproduction, and the circulation of culturally specific knowledge. Research examining this tension could strengthen understanding of how digital technologies simultaneously create opportunities for knowledge renewal and new challenges for knowledge protection.

Finally, future research could extend the outcome dimension beyond firm-level sustainable competitiveness to examine broader ecosystem-level consequences of digitally augmented indigenous knowledge management, including cultural resilience, heritage preservation, sustainable tourism, circular economy development, and inclusive regional development. Such research could clarify whether the mechanisms identified in DT-IKMC contribute not only to the competitiveness of individual MSMEs but also to the long-term sustainability of culturally rooted creative ecosystems.

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