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Transforming Local Guiding Competencies Through Digital Training Ecosystems: A Case Study of Batu Tering Megalithic Site, Sumbawa

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Abstract

The Batu Tering megalithic site in Sumbawa Regency holds immense archaeological value as a heritage asset; however, optimization of this site is restricted by gaps in local guiding competencies and limited digital literacy. This study delineates a strategic framework to transform local guiding capacities by implementing a digital training ecosystem that integrates Augmented Reality (AR), Large Language Models (LLMs), and gamification elements for the local Tourism Awareness Group (Pokdarwis). Adopting a descriptive qualitative approach, data were gathered through field observations, in-depth interviews with twelve key informants, and documentation. The findings indicate that converging immersive technology with AI-driven narrative generation effectively bridges the digital divide, converting static megalithic data into engaging, structured, and culturally authentic narratives. This transformation enhances the local community's storytelling capabilities and self-efficacy. This study proposes a comprehensive digital training model supported by a SWOT-aligned development strategy to sustainably improve destination competitiveness while preserving the physical sanctity of heritage assets.

Keywords: Guiding Competency, Digital Training, Augmented Reality, Large Language Models, Community-Based Tourism.

INTRODUCTION

The global tourism industry is currently experiencing a profound paradigm shift toward experiential travel that prioritizes cultural authenticity and meaningful interactions. Modern travelers increasingly seek destination ecosystems that offer authentic engagement with local heritages, shifting demand away from mass tourism toward community-based models. In this context, Adi Putra et al. (2025) emphasize that the development of localized attraction models serves as a critical pathway to foster inclusive regional economic growth and enhance sustainable destination competitiveness. To ensure the long-term viability of these alternative tourism frameworks, proactive community participation must be systematically supported by structured capacity-building initiatives and tailored promotional media.

According to Supriyadi (2025), digital transformation has evolved from a simple operational tool into an indispensable driver of long-term sustainability and strategic competitiveness across service-oriented industries. Within the contemporary hospitality and tourism landscape, the adoption of advanced technology requires a managerial transition from conventional transactional services to relational, experience-based interactions. This modern management perspective underscores the necessity of harmonizing technological innovations with a high degree of personal service and cultural authenticity. Consequently, heritage tourism providers are required to upgrade their standard operating procedures and embrace digital ecosystems to remain relevant amidst rapidly changing consumer behavior.

The ultimate success of community-based tourism models depends heavily on the operational readiness and structural involvement of local institutions, such as the Tourism Awareness Group (Pokdarwis). Hulu (2024) asserts that these local tourism groups function as the primary guardians of cultural values and act as the principal operational pillar for village-based destinations. When local residents assume direct ownership of their tourism assets, the community can establish sustainable socio-economic autonomy and protect native traditions from external exploitation. However, many rural tourism collectives continue to struggle in managing their cultural resources effectively due to limited exposure to modern vocational training programs.

A prominent example of a valuable cultural heritage destination facing organizational challenges is Batu Tering Village, located in the Moyo Hulu District of Sumbawa Regency. Nugraheni et al. (2025) demonstrate that systematically analyzing natural potential and

engaging in local community empowerment are essential steps for formulating viable tourism attraction models in rural regions. This destination possesses extraordinary geographical characteristics and rare archaeological assets, most notably ancient megalithic sarcophagi scattered throughout adjacent forest areas. Although these artifacts represent significant historical testimony to the ancient Samawa civilization, the lack of professional product packaging currently limits their socio-economic contribution to the village community.

Nadya (2025) highlights that human resource competency gaps between urban centers and rural areas often serve as the primary factor inhibiting sustainable destination management. Preliminary observations at the Batu Tering site reveal similar vulnerabilities, particularly regarding the low digital literacy among active Pokdarwis members and the widespread disengagement of productive local youth. Furthermore, the complete absence of physical interpretive signage and standardized historical narratives causes visiting tourists to view these monumental stone structures as silent physical relics devoid of philosophical meaning. This critical informational gap underscores the urgent need for a smart and localized interpretive medium such as QR code markers placed on site that can instantly link physical archaeological assets with interactive digital resources to assist local guides during guest interactions. Without systematic educational intervention and skills upgrading at the grassroots level, local guides remain unable to deliver globally competitive interpretive services.

To address these critical limitations in physical site interpretation, Augmented Reality technology offers an advanced, non-destructive visualization methodology. Indarta et al. (2025) explain that Augmented Reality systems are capable of constructing immersive real-world learning environments that project intricate details with high technical precision. Through personal mobile devices, complex internal chambers and eroded symbolic carvings of the fragile sarcophagi can be dynamically overlaid without endangering the authentic physical materials of the heritage site. This interactive visual transition not only simplifies the translation of dense archaeological data but also enriches the overall learning experience for both training guides and visiting tourists.

As established by Annamalai et al. (2025), advanced artificial intelligence technologies play an instrumental role in restructuring how instructional content is consumed by expanding perceived user competence and educational autonomy. In the context of heritage guiding, the integration of Large Language Models serves as a robust tool to overcome severe narrative and linguistic limitations among rural tour guides. By utilizing

artificial intelligence as a narrative drafting assistant, dense scientific records can be translated into concise, culturally accurate, and multilingual micro-storytelling scripts. This technological intervention allows local practitioners to consistently communicate profound historical meanings to global millennial audiences in an engaging and accessible manner.

To guarantee that digital learning methods remain engaging and resilient against training fatigue, the operational framework must incorporate structured gamification elements. Conventional capacity-building programs often suffer from low participant retention and passive engagement, especially among historically disadvantaged rural communities. Rifani and Ayuningsih (2025) confirm that the integration of interactive game mechanics and digital storytelling significantly strengthens cognitive engagement and deepens cultural awareness during heritage site exploration. By incorporating digital reward mechanisms, such as achievement badges and structured competence progressions, independent vocational training transforms into a competitive and intrinsically rewarding community activity.

Although existing scientific literature addresses the discrete usage of immersive visualization, artificial intelligence, and gamification, there remains a notable research gap regarding their convergence into a unified human resource training ecosystem. Wong (2012) emphasizes that mobile-based seamless learning architectures provide an ideal platform for autonomous study by allowing learners to acquire procedural competencies across physical and digital spaces. Drawing directly upon this conceptual framework, this study introduces and evaluates the "Samawar" application, an integrated QR-code-based mobile training and interpretation system custom-designed for the local guides of Batu Tering Village. Ultimately, this comprehensive digitalization strategy offers an innovative academic blueprint to elevate guiding standards, foster localized economic independence, and advance sustainable tourism competitiveness.

METHOD

Research Approach and Design

This study utilizes a descriptive qualitative approach with a case study design to provide a comprehensive, contextual, and in depth exploration of the digitalization of heritage guide training. As demonstrated by Nugraheni et al. (2025), a descriptive qualitative design is highly effective for identifying specific tourism potentials and formulating attraction models rooted in local wisdom without being restricted by rigid quantitative boundaries. This research approach allows the researcher to act as the primary instrument

in exploring how digital technologies are adopted and implemented within a localized, community managed destination.

Operationally, the case study design connects smart tourism theory with actual cultural preservation practices by analyzing the unique geographical and infrastructural challenges of Batu Tering Village. In accordance with the methodological framework of Annamalai et al. (2025), utilizing a well validated qualitative model provides a robust foundation for understanding the nuances of digital technology adoption among grassroots stakeholders. By focusing on the strategy for increasing human resource capacity, this design systematically maps the social capital dynamics that determine the success of technology driven vocational training in rural regions.

Informants and Sampling Techniques

The determination of research informants was carried out using a purposive sampling technique, which involves selecting participants based on predefined criteria to ensure they possess the most relevant information for the study objectives. Annamalai et al. (2025) emphasize that engaging diverse stakeholders is essential to capture a multidimensional perspective of technology integration, especially when assessing user autonomy and digital engagement. To achieve this, the researcher established twelve key informants as primary data sources, ensuring that both grassroots practitioners and regional policy makers were represented in the study.

To maintain research validity and ethical standards, the informants were divided into distinct functional groups whose views were triangulated to avoid analytical bias. Chen and Park (2022) suggest that bridging the gap between theoretical expert advice and local operational practices significantly enhances the long term viability of professional training programs. The first informant group consisted of local Pokdarwis managers and active tour guides, while the second group comprised an expert panel of archaeologists, linguists, cultural historians, and IT specialists. Additional insights were gathered from Sumbawa cultural tourism officers and millennial tourists to evaluate market expectations and policy alignment.

Data Collection Techniques

Data collection was executed through a rigorous technical triangulation method that combined participatory field observations, detailed interviews, and documentation studies to ensure a holistic overview of the training needs and tool usability. During the participatory field observation phase, the research team conducted live trials of the Samawar mobile

application, which utilizes QR codes mounted directly near the megalithic sarcophagi to trigger localized digital narratives and Augmented Reality reconstructions. Following the methodological framework of Indarta et al. (2025), conducting these direct application trials in the physical destination setting is critical to evaluate user interactions, technical usability, and the technological adaptability of local guides when presenting historical facts to visitors. This hands on testing allowed the researcher to observe firsthand how local Pokdarwis guides and international tourists scanned the QR codes to access the digital training ecosystem.

To capture the qualitative feedback generated during these interactive on site trials, systematic documentation and interviews were carried out concurrently at the Batu Tering site. As demonstrated by Widyawan et al. (2025), integrating physical QR code markers at historical heritage assets serves as an effective educational conduit that connects physical outdoor environments with rich, structured digital learning systems. The researcher conducted semi structured interviews and rapid feedback sessions immediately after the guides and tourists finished interacting with the Samawar application. This combination of real time software testing, photographic documentation of the field trials, and subsequent interviews provided the verified qualitative insights necessary to refine the vocational training framework and evaluate its overall effectiveness.

Data Analysis Techniques

All collected textual, oral, and visual data were managed and analyzed thematically using NVivo software to preserve the accuracy, objectivity, and transparency of the qualitative interpretation. Annamalai et al. (2025) explain that the systematic mapping of qualitative variables is highly necessary to establish the nuanced relationships between human motivation and technological features. Through thematic coding in NVivo, the researcher organized participant responses into core analytical nodes, which included physical site integrity, narrative authenticity, and local economic sustainability.

The final stage of the analysis involved an interactive model of qualitative analysis integrated with a strategic SWOT matrix to formulate the training blueprint. As illustrated by Supriyadi (2025), utilizing an interactive analysis model consisting of data condensation, data display, and conclusion drawing allows researchers to synthesize field facts into actionable, long term strategic plans. During the data display phase, a SWOT matrix was constructed to analyze the probability of success for AR, LLM, and gamification training tools within the rural constraints of Batu Tering. This systematic process ensured that the final

recommendations were methodologically sound, culturally authentic, and practically applicable for the tourism industry.

RESULTS AND DISCUSSION

Evaluation of the Samawar QR Code System in Live Guiding Scenarios

The empirical trials of the Samawar application at the Batu Tering site demonstrated that integrating physical QR code markers on the ancient rock surfaces successfully bridged the historical interpretive gap. When international and local visitors scanned the QR codes mounted near the megalithic sarcophagi, they were instantly presented with interactive visual reconstructions and localized historical narratives on their mobile devices. As emphasized by Widyawan et al. (2025), utilizing QR code based interfaces at open air cultural heritage sites provides an immediate and highly efficient educational conduit that transforms static ancient objects into active learning media. The real time accessibility of this information allowed local guides to explain the complex structural and philosophical attributes of the sarcophagi with greater precision.

The success of the Samawar digital ecosystem was further validated by the direct feedback collected from international tourists immediately following their on site interactions. Visitors, including international tourists who engaged in the live scanning trials, actively participated in writing down their evaluations and experiences on the provided feedback forms. Following the core concepts of smart tourism discussed by Annamalai et al. (2025), allowing users to interact autonomously with smart digital tools significantly enhances their perceived competence and enriches the overall quality of their educational dining and cultural experiences. The positive responses gathered from these international tourists confirmed that the digital narrative delivery was both linguistically accessible and historically engaging, which elevated their overall appreciation of the ancient Samawa heritage.

Local Guiding Competency Enhancement and Pokdarwis Capacity Building

To evaluate the impact of this digital training framework on the local guides, a structured evaluation session was conducted with the Pokdarwis members in their local wooden meeting gazebo. During this session, active guides completed detailed evaluation questionnaires to assess their narrative improvement, technological comfort, and overall self efficacy. Nugraheni et al. (2025) note that structured community capacity building and the creation of localized educational materials are the fundamental pillars of successful community based tourism in rural regions. By analyzing their written responses, the

research team identified a significant increase in the guides confidence and their ability to structure historical storytelling systematically without relying on outside experts.

This collaborative evaluation process also revealed that the integration of the Samawar application effectively reduced the guiding competency gaps that previously hindered the village tourism potential. By having immediate access to archaeologically accurate and multilingual scripts on their phones, the Pokdarwis guides felt empowered to lead international groups and handle complex historical inquiries. As established by Chen and Park (2022), participative vocational training that combines actual digital tool usage with immediate feedback loops is highly effective for building long term professional resilience and accelerating technology adoption among rural practitioners. The guides noted that the gamified progression elements within the training ecosystem motivated them to continuously practice their guiding skills.

SWOT Matrix and Strategic Development of the Digital Heritage Training Ecosystem

The successful execution of these field trials provided critical data to validate the SWOT matrix designed for the sustainable development of the Batu Tering digital training ecosystem. Supriyadi (2025) argues that the long term success of digital transformation in service and hospitality sectors depends heavily on aligning technological sophistication with local operational readiness and cultural authenticity. Based on the positive interactions witnessed during the on site trials involving both local guides and international tourists, the research team synthesized the strategic pathways to ensure the training framework can be maintained permanently.

Table 1. Strategic SWOT Matrix for Digital Guiding Competency Development

Strategic Factors	**STRENGTHS (S)** ➢ S1. Original and highly authentic megalithic sarcophagus heritage assets. ➢ S2. Proactive community interest and deep localized oral	**WEAKNESSES (W)** ➢ W1. Low baseline digital literacy among rural community members. ➢ W2. Pronounced gaps in professional guiding competencies.

	➢ S3. Established and active local tourism awareness group network.	➢ W3. Limited telecommunication signal infrastructure at the site.
OPPORTUNITIES (O) ➢ O1. Rising global demand for smart tourism and interactive technologies. ➢ O2. Increasing interest among younger visitors in immersive learning. ➢ O3. Availability of regional government funding for digital rural development.	**SO STRATEGIES** ➢ SO1. Develop mobile three dimensional reconstructions of sarcophagi to align with smart tourism trends (S1, O1). ➢ SO2. Package indigenous oral storytelling into interactive digital guides to attract younger demographics (S2, O2).	**WO STRATEGIES** ➢ WO1. Launch an offline capable mobile application to bypass local telecommunication infrastructure limitations (W3, O3). ➢ WO2. Utilize artificial intelligence narrative composers to mitigate professional language barriers for local guides (W2, O1).
THREATS (T) ➢ T1. Exposure of fragile prehistoric artifacts to physical degradation. ➢ T2. Gradual erosion of ancestral cultural values among rural youth. ➢ T3. Operational constraints caused by unsustainable visitor volumes.	**ST STRATEGIES** ➢ ST1. Promote augmented reality visualization as a non contact conservation tool to protect fragile prehistoric relics (S1, T1). ➢ ST2. Implement gamified historical quests to engage rural youth in local heritage	**WT STRATEGIES** ➢ WT1. Deliver gradual, mentor led hybrid training programs to steadily build local digital capacities (W1, T2). ➢ WT2. Integrate digital visitor monitoring and reservation management to mitigate over tourism risks (W3, T3).

	preservation (S3, T2).	

CONCLUSION

This research concludes that the transformation of local guiding competencies at the Batu Tering Megalithic Site can be successfully achieved through the strategic implementation of the Samawar digital training ecosystem. The convergence of Augmented Reality, Large Language Models, and gamification mechanisms successfully transforms static archaeological artifacts into dynamic educational assets, effectively bridging the digital divide among local guides. By synergizing immersive technology with artificial intelligence driven storytelling, the model not only sustains visitor engagement but also cultivates essential social capital, fostering a robust network of practitioners dedicated to professional and sustainable tourism practices.

On a broader scale, this digital transformation serves as a strategic reference for developing historical tourism destinations across Indonesia, offering a scalable solution for regions with similar geographical or accessibility constraints. Strengthening local competencies in digital literacy and narrative delivery constitutes a fundamental pillar for long term economic independence and the realization of a globally competitive smart tourism ecosystem. Despite prevailing technical challenges in rural connectivity, this study reaffirms that the future of heritage preservation lies in the harmonious integration of contemporary technological innovation with ancestral values, anchored firmly in the sovereignty of the local community.

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