

Digital Heritage Interpretation for Sustainable Tourism in the Subak Cultural Landscape of Bali

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Abstract:

Tourism experiences in heritage landscapes are frequently dominated by visual appreciation, resulting in limited understanding of the cultural philosophies embedded within traditional management systems. Jatiluwih Village in Bali, internationally recognized for its terraced rice fields and the Subak irrigation system as a UNESCO World Cultural Heritage Site, faces similar challenges, where visitor engagement remains largely superficial. This study aims to develop and evaluate a digital-based heritage interpretation strategy that enhances cultural understanding and supports sustainable tourism. Using a Research and Development approach adapted from the Borg and Gall model, the study comprised preliminary research, prototype development, and limited field trials. Data were collected through surveys of one hundred and fifty tourists, semi-structured interviews, and focus group discussions with *pekaseh*, tour guides, and village tourism managers. Quantitative data were analyzed descriptively, while qualitative data were examined using thematic analysis. The results indicate that more than seventy per cent of visitors had limited prior knowledge of Subak, despite demonstrating a strong interest in digitally mediated learning. Interactive digital books integrated with Quick Response codes emerged as the most preferred interpretation medium, followed by educational videos, with the majority of respondents willing to access heritage information digitally on-site. Limited trials further demonstrate that the digital interpretation prototype enhanced visitor engagement, strengthened tour guides' interpretive capacity, and reduced narrative inconsistencies. This study contributes to heritage tourism literature by illustrating how digital interpretation can function as an effective edutourism mechanism, facilitating cultural transmission and reinforcing sustainable heritage management through collaborative stakeholder involvement.

Keywords: Digital Heritage Interpretation; Edutourism; Heritage Management; Subak Cultural Heritage; Sustainable Tourism.

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Introduction

Jatiluwih Village, located in Tabanan Regency, Bali, is internationally recognized for its terraced rice fields and the traditional Subak irrigation system, which has been inscribed as a UNESCO World Cultural Heritage Site since 2012 (Widari, 2015). Beyond its visual appeal as an agricultural landscape, Subak represents a complex socio-cultural institution that has governed water management, agricultural practices, and spatial organization in Bali for centuries. Rooted in the Tri Hita Karana philosophy, Subak embodies principles of harmony between humans and God (Parahyangan), among humans (Pawongan), and between humans and nature (Palemahan) (Windia et al., 2005). Accordingly, Subak should be understood not merely as a technical irrigation system but as a living cultural heritage that reflects the foundational values sustaining Balinese agricultural life and environmental balance. This perspective is reinforced by recent studies highlighting Subak as an integrated ecological and cultural system (Ardana et al., 2024) and as part of Bali's long-standing water civilization rooted in sustainable built environments (Geria et al., 2023).

Despite its outstanding universal value, the long-term sustainability of Subak is increasingly under threat. Rapid tourism development and broader socio-economic transformations have accelerated agricultural land conversion, weakened traditional farming practices, and reduced farmer regeneration (Dwipradnyana, 2019; Sutawan, 2012). The growing shift in local livelihoods from agriculture to tourism has further intensified these pressures, as younger generations increasingly perceive farming as economically less attractive than tourism-related occupations (Windia, 2018). These dynamics raise critical concerns regarding the continuity of Subak, both as a functional irrigation system and as a socio-cultural institution embedded within Balinese heritage.

From a tourism perspective, existing studies suggest that visitor engagement with Jatiluwih remains largely superficial. Tourists tend to appreciate the rice terraces primarily as a scenic landscape, with limited understanding of the cultural philosophy and social system underpinning Subak. Utari et al. (2021) demonstrate that most visitors possess only minimal knowledge of Subak's cultural values and philosophical foundations. This condition poses a significant risk, as tourism experiences that prioritize visual consumption may reduce Subak to a passive aesthetic backdrop, detaching it from its cultural meaning and sustainability. In this context, heritage interpretation becomes a critical mechanism. As emphasized by Nowacki (2021), effective cultural heritage interpretation extends beyond information provision to communicate meanings and values that foster emotional and intellectual connections between visitors and heritage resources. Without adequate interpretation, tourism engagement remains detached from the cultural essence that sustains heritage systems such as Subak.

The integration of educational dimensions into tourism experiences, commonly referred to as edutourism, offers a strategic response to this limitation. Abrahams and Bama (2023) argue that edutourism enhances visitor engagement while simultaneously strengthening destinations' long-term strategic value. Research on eco-edutourism development also emphasizes the importance of combining environmental conservation, education, and community participation in tourism destinations (Susanto et al., 2021). In the context of Jatiluwih, edutourism is particularly relevant, as it has the potential to transform tourism from passive sightseeing into meaningful cultural learning processes. However, the effective implementation of edutourism in heritage destinations requires interpretation media capable of communicating complex cultural knowledge in accessible, engaging, and context-sensitive formats.

Recent scholarship highlights the strategic role of digital technologies in enhancing heritage interpretation and educational tourism. Drawing on the Technology Acceptance Model proposed by Davis (1989), user engagement with digital media is largely influenced by perceived usefulness and perceived ease of use. Digital tools, including interactive books, multimedia content, and mobile-based applications, enable flexible and interactive access to information, thereby deepening visitor involvement with cultural heritage. Empirical studies support this view. Hastuti et al. (2023) report that digitalization in tourism villages improves information accessibility and strengthens educational appeal, while Halim et al. (2023) identify digital transformation as a key component in smart village development. Similarly, Pramesti (2024) demonstrates the effectiveness of digital media such as educational videos and interactive books in supporting tourism promotion and cultural education, particularly among younger and technologically oriented audiences.

Despite the growing body of literature on digital tourism, heritage interpretation, and edutourism, a critical research gap remains. Existing studies predominantly examine digitalization in tourism villages from general, managerial, or promotional perspectives, while limited attention has been given to the systematic development of digital interpretation strategies specifically designed to convey the cultural philosophy and values embedded in heritage irrigation systems such as Subak. Moreover, few studies adopt a development-oriented approach that integrates local stakeholder perspectives and empirically evaluates the effectiveness of digital interpretation media in enhancing visitor understanding and supporting heritage sustainability.

Addressing this gap, the present study aims to develop a digital heritage interpretation strategy for Subak cultural heritage through the creation of an interactive digital book integrated with QR codes. This approach is designed to function as an interpretative, educational, and promotional medium for both tourists and local communities. Academically, the study contrib-

utes to the literature on edutourism, digital heritage interpretation, and technology acceptance by proposing an empirically grounded development model tailored to cultural irrigation heritage. Practically, the study supports Subak preservation efforts, strengthens local cultural identity, and enhances the positioning of Jatiluwih as a sustainable, education-oriented heritage tourism destination.

Methodology

Research Design and Study Area

This study employed a Research and Development (R&D) approach adapted from the simplified Borg and Gall (1983) model, comprising three sequential stages: preliminary research, product development, and limited trials. The R&D design was selected to address the dual objectives of the study, namely, to generate empirical insights into current heritage interpretation practices and to produce a tangible interpretative output in the form of an interactive digital book on Subak cultural heritage. The developed product was intended to function both as an educational medium for tourists and as a tool supporting cultural preservation and sustainable tourism development.

The research was conducted in Jatiluwih Village, Tabanan Regency, Bali, a tourism destination characterized by terraced rice fields and the traditional Subak irrigation system, which has been recognized as a UNESCO World Cultural Heritage Site since 2012. The site was purposively selected because it represents a living heritage system grounded in the Tri Hita Karana philosophy while simultaneously experiencing increasing pressures from tourism development and modernization. Data collection was carried out between 12 and 14 June 2025, coinciding with the peak tourist season, to ensure adequate visitor representation and to capture authentic post-visit perceptions relevant to heritage interpretation and educational tourism experiences.

Participants and Recruitment Procedures

The study involved two primary groups of participants: tourists and local stakeholders. Tourist respondents consisted of 150 visitors to Jatiluwih Village. Participants were recruited using accidental sampling, whereby tourists encountered at key locations within the site such as entrance gates, walking paths, and viewing areas were invited to participate voluntarily after completing their visit. Inclusion criteria required respondents to be at least 18 years of age and willing to provide informed consent. This sampling strategy was employed to capture a heterogeneous range of visitor profiles and immediate experiential responses related to Subak knowledge, information needs, and preferred interpretation media.

Local stakeholders were recruited using purposive sampling due to their direct involvement in Subak management, cultural preservation, and tourism activities. This group comprised *pekaseh* (Subak leaders), Subak farmers, tour guides, and village tourism managers. Stakeholders were identified in coordination with village authorities and Subak organizations to ensure that participants possessed relevant experiential and contextual knowledge. Data from this group were collected through semi-structured interviews and Focus Group Discussions (FGDs), enabling in-depth exploration of stakeholder perspectives on interpretation challenges, cultural sustainability, and digital media adoption.

Development of Research Questions

Research questions were developed through an iterative process grounded in both theoretical frameworks and empirical exploration. Initially, an extensive literature review was conducted on Subak cultural heritage, sustainable tourism, heritage interpretation, edutourism, and digitalization in tourism villages (Davis, 1989; Nowacki, 2021; Abrahams & Bama, 2023; Hastuti et al., 2023; Halim et al., 2023; Pramesti, 2024). This review facilitated the identification of conceptual gaps related to tourists' limited understanding of Subak philosophy and the lack of systematically designed digital interpretation media.

Subsequently, preliminary field observations, tourist surveys, interviews, and FGDs were undertaken to contextualize these theoretical insights within the specific conditions of Jatiluwih

Village. Insights from this preliminary stage informed the formulation of research questions focusing on:

1. tourists' knowledge, perceptions, and information needs regarding Subak cultural heritage;
2. stakeholder perspectives on challenges and opportunities in Subak interpretation and preservation; and
3. the effectiveness of digital interpretation media in enhancing educational tourism experiences and supporting cultural sustainability.
4. This process ensured that the research questions were theoretically informed, empirically grounded, and directly aligned with the study's development-oriented objectives.

Research Procedure

The research procedure followed three sequential stages adapted from Borg and Gall (1983):

1. Preliminary Research
This stage involved a literature review, tourist questionnaires, semi-structured interviews, and FGDs to identify existing interpretation gaps, assess visitor information needs, and establish content and design requirements for Subak educational media.
2. Product Development
Based on findings from the preliminary stage, an initial prototype of the interactive digital Subak book was developed. The content incorporated local narratives, photographs, illustrations, maps, and QR codes, and was designed in accordance with principles of heritage interpretation (Nowacki, 2021) and edutourism (Abrahams & Bama, 2023). Content validity was ensured through iterative consultation with local stakeholders and subject-matter experts.
3. Limited Trial
The draft digital book was distributed to selected *pekaseh*, tour guides, tourism managers, and tourists for evaluation. Feedback was collected regarding content clarity, cultural relevance, design quality, and usability. These criteria were used as evaluative indicators to refine and improve the digital product prior to broader dissemination.

Data Collection and Analysis

The study adopted a mixed-methods approach by integrating quantitative and qualitative data to enhance analytical robustness. Quantitative data were collected through structured tourist questionnaires and analyzed using descriptive statistics, including frequencies and percentages, to describe respondent characteristics, levels of Subak knowledge, and preferences for interpretation media.

Qualitative data were obtained through interviews, FGDs, and field documentation, including observational notes and photographs. These data were analyzed using thematic analysis, involving systematic coding, categorization, and interpretation of recurring patterns related to interpretation needs, cultural values, and digital media effectiveness.

Integration of quantitative and qualitative findings was conducted at the interpretation stage to triangulate results and formulate a comprehensive digital heritage interpretation strategy for Subak cultural heritage. This integrative analysis also enabled an evaluation of the developed digital book's effectiveness as an educational medium supporting cultural sustainability and heritage preservation.

Results and Discussions

Results

Tourist Profile and Visit Characteristics

An overview of respondents' demographic characteristics, visit experience, sources of information, levels of knowledge about Subak, and preferences for educational media is summarized in Table 1. The survey was conducted during the preliminary research stage between 12 and 14 June 2025 and involved 150 tourists visiting Jatiluwih Village.

As shown in Table 1, European visitors constituted the dominant segment, accounting for 64% of respondents. Domestic tourists represented 13.3%, followed by visitors from Asia (10%), the Americas (5.3%), Australia (4.7%), and Africa (2.7%). This distribution confirms the strong orientation of Jatiluwih toward international particularly European tourism markets, highlighting the need for interpretation media that are linguistically accessible and culturally explanatory for foreign visitors.

Table 1. Summary of Questionnaire Dissemination

Aspect	Category	Number (people)	Percentage (%)
Tourist Origin	Europe	96	64.0
	Domestic (Indonesia)	20	13.3
	Asia	15	10.0
	Americas	8	5.3
	Australia	7	4.7
	Africa	4	2.7
Gender	Male	78	52.0
	Female	72	48.0
Age	< 20 years	5	3.3
	20–30 years	42	28.0
	31–40 years	36	24.0
	41–50 years	38	25.3
	> 50 years	29	19.3
Occupation	Professional	101	67.3
	Entrepreneur	17	11.3
	Civil Servant (ASN)	12	8.0
	Student	6	4.0
	Other	14	9.3
Visit Experience	First time	137	91.3
	Have visited before	13	8.7
Visit Motivation	Rice-terrace scenery	95	63.3
	Culture and traditions	30	20.0
	Trekking	15	10.0
	Photography	10	6.7
Information Source	Internet & social media	72	48.0
	Tour guide	42	28.0
	Friends/relatives	21	14.0
	Other	15	10.0
Level of Knowledge about Subak	No knowledge at all	45	30.0
	Know a little	65	43.3
	Familiar	30	20.0
	Very familiar	10	6.7
Interest in Subak	History	102	68.0
	Tri Hita Karana philosophy	95	63.3
	Farmers' lives	85	56.7
	Rituals	80	53.3
	Irrigation process	78	52.0
	Modernization challenges	66	44.0
	Digital book	90	60.0
Preferred Educational Media	Educational video	70	46.7
	Mobile application	35	23.3
	AR/VR	25	16.7
	Virtual tour	15	10.0
Preferred Interactive Features	Photos & illustrations	115	76.7
	Video	95	63.3
	Interactive map	85	56.7
	Audio	50	33.3
	Quiz	40	26.7
Digital Access / Content Sharing	Willing to access via QR code	120	80.0
	Very likely to share	65	43.3

Likely to share	50	33.3
Will not share	35	23.4

Source: Authors' field survey, Jatiluwih, 2025

Gender distribution among respondents was relatively balanced, with males accounting for 52% and females for 48%. The age profile indicates that the majority of visitors were young to middle-aged adults. Visitors aged 20–30 years comprised 28% of the sample, followed by those aged 31–40 years (24%) and 41–50 years (25.3%). Respondents under 20 years old accounted for only 3.3%, while those over 50 years represented 19.3%. This composition suggests that most visitors belong to productive and digitally literate age groups, reinforcing the relevance of digital interpretation media.

In terms of occupation, professionals formed the largest group (67.3%), followed by entrepreneurs (11.3%), civil servants (8%), students (4%), and other occupations (9.3%). Notably, 91.3% of respondents were first-time visitors to Jatiluwih, indicating limited prior exposure to Subak-related information and underscoring the importance of on-site interpretation for initial visitor understanding.

Visitor Motivation and Information Sources

Survey results indicate that visual appreciation of the rice terraces remains the primary motivation for visiting Jatiluwih. As presented in Table 1, 63.3% of respondents cited scenic enjoyment as their main motivation, while cultural and traditional interest accounted for 20%. Other motivations included trekking (10%) and photography (6.7%). These findings suggest that although cultural interest exists, it remains secondary to landscape-based motivations, reinforcing concerns about the superficial consumption of heritage.

Prior to their visit, tourists relied predominantly on digital information channels. Internet and social media platforms were the main sources of information for 48% of respondents, followed by tour guides (28%), friends or relatives (14%), and other sources (10%). This pattern highlights the strategic importance of digital media in shaping visitor expectations and knowledge before arrival, as well as the potential role of digital interpretation tools in complementing or substituting direct guide-based explanations.

Knowledge and Interest in Subak Cultural Heritage

Despite Jatiluwih's UNESCO designation, tourists' prior knowledge of the Subak system was generally limited. As indicated in Table 1, 30% of respondents reported having no knowledge of Subak, while 43.3% stated that they knew very little. Only 20% indicated familiarity, and a mere 6.7% considered themselves very familiar with the system. Overall, more than 70% of visitors entered the destination with minimal understanding of Subak as a cultural and irrigation system.

In contrast to this limited knowledge, respondents expressed strong interest in learning about Subak. Interest in Subak history was reported by 68% of tourists, followed by the Tri Hita Karana philosophy (63.3%), farmers' livelihoods (56.7%), rituals (53.3%), irrigation processes (52%), and modernization-related challenges (44%). This discrepancy between low prior knowledge and high learning interest indicates a substantial interpretative gap and reveals significant potential for educational and edutourism-oriented interventions.

Preferences for Educational Media and Digital Features

Tourists demonstrated a clear preference for digital-based educational media. As summarized in Table 1, digital books were the most favored medium (60%), followed by educational videos (46.7%) and mobile applications (23.3%). More advanced technologies, such as augmented or virtual reality and virtual tours, attracted comparatively lower interest, suggesting that accessible and low-complexity digital formats are more appropriate for this visitor segment.

Regarding preferred digital features, photos and illustrations were selected by 76.7% of respondents, followed by videos (63.3%) and interactive maps (56.7%). Audio features and quizzes were less preferred. Importantly, 80% of respondents expressed willingness to access

educational content through QR codes. Furthermore, a substantial proportion indicated their likelihood of sharing digital content, with 43.3% reporting being very likely and 33.3% likely to do so. These findings suggest strong potential for digital interpretation tools to extend visitor engagement beyond the site through content sharing.

Focus Group Discussion Findings

Findings from the Focus Group Discussion involving tour guides, *pekaseh*, customary leaders, and tourism managers revealed several structural challenges in Subak interpretation. A key issue identified was the limited number of tour guides relative to visitor volume, resulting in many tourists receiving little or no explanation during their visit. Language barriers further exacerbated this issue, particularly given the predominance of European visitors and the limited foreign language proficiency among some guides.

Participants also highlighted inconsistencies in the depth and accuracy of information delivered to tourists. Not all guides possessed comprehensive knowledge of Subak, including its philosophical foundations, irrigation mechanisms, rituals, and farmers' livelihoods. These inconsistencies were perceived as reducing the overall quality of visitor understanding and potentially misrepresenting Subak as a cultural system. Consequently, FGD participants collectively emphasized the need for standardized, accurate, and easily accessible digital educational materials to support both guides and independent visitors.

Product Development and Limited Trial Results

Based on the preliminary research findings, an interactive digital book on Subak cultural heritage was developed. The content covered Subak history, the Tri Hita Karana philosophy, irrigation processes, farmers' livelihoods, and challenges related to modernization. The digital book incorporated photographs, illustrations, and short videos accessed through QR codes and was structured in accordance with principles of heritage interpretation and edutourism.

During the limited trial stage, the digital book was distributed to *pekaseh*, tourism managers, tour guides, and selected tourists. Stakeholder feedback indicated that the digital book was perceived as a useful tool for supporting Subak preservation and assisting guides in delivering consistent explanations to visitors. Tourists reported that the digital book was easy to use and more engaging than verbal explanations alone. Suggestions for improvement primarily concerned the inclusion of additional contextual photographs illustrating farmers' daily activities. These inputs were incorporated into subsequent revisions of the digital product.

Discussions

The findings of this study reveal a critical disjunction between tourists' visual engagement with the Jatiluwih landscape and their understanding of Subak as a complex cultural and irrigation system. Although the majority of visitors belong to productive-age groups and are accustomed to digital technology, more than 70% of respondents reported minimal prior knowledge of Subak. At the same time, tourists expressed strong interest in interactive educational media, particularly digital books and videos. This pattern indicates that the challenge facing heritage tourism in Jatiluwih is not a lack of visitor interest but rather the absence of effective interpretation mechanisms capable of translating visual appreciation into cultural understanding.

From a heritage interpretation perspective, these findings empirically reinforce Nowacki's (2021) assertion that interpretation should move beyond factual information delivery toward the communication of meanings and values that are emotionally and intellectually engaging. The interactive digital book developed in this study operationalizes this principle by embedding Subak narratives, philosophical foundations, and everyday practices within an accessible digital format. The integration of QR codes enables a flexible, visitor-centered interpretation process that reduces dependence on tour guide availability and addresses the inconsistencies in narrative depth identified through the Focus Group Discussions. In doing so, the study supports and extends prior research emphasizing the growing role of digital interpretation tools in enhancing interpretive depth and visitor engagement in heritage tourism contexts (Moreno-Melgarejo et al., 2019).

Viewed through an edutourism lens, the results align with Abrahams and Bama's (2023) argument that tourism experiences enriched with educational elements enhance visitor engagement while strengthening destination sustainability. The digital book allows tourists to actively explore Subak history, the Tri Hita Karana philosophy, irrigation practices, and contemporary challenges, thereby transforming passive sightseeing into structured cultural learning. The incorporation of visual elements, illustrations, and interactive maps further facilitates experiential learning, which is central to edutourism practices (Sumarmi et al., 2020). Importantly, this study extends edutourism theory by demonstrating that digital interpretation media can simultaneously function as educational tools, experiential enhancers, and cultural mediation instruments within living cultural landscapes.

The findings also contribute to the Technology Acceptance Model (TAM) by providing empirical evidence from a heritage tourism context. Consistent with Davis (1989), tourists' strong preference for digital books and their willingness to access content via QR codes indicate high levels of perceived usefulness and perceived ease of use. The positive reception of the digital book suggests that digital interpretation media aligned with tourists' technological habits and information-seeking behaviors are more likely to be adopted. Moreover, feedback requesting multilingual content and richer visual materials highlights the importance of information quality and contextual relevance, supporting later extensions of TAM that emphasize content relevance as a critical determinant of technology acceptance (Kraja et al., 2025).

Beyond visitor experience, the Focus Group Discussion findings reveal broader structural challenges commonly faced by tourism villages, including limited guide capacity, language barriers, and fragmented knowledge transmission. In this respect, the study supports Polukhina et al. (2025), who argue that digitalization enables tourism villages to evolve into integrated digital ecosystems rather than remain solely physical destinations. The digital book developed in this research thus functions not only as an interpretive and educational medium but also as a cultural preservation instrument. By systematically documenting Subak knowledge, philosophies, and practices, the digital book contributes to intergenerational knowledge transfer and mitigates the risk of cultural erosion associated with occupational shifts and modernization pressures.

Theoretical Implications

This study makes three interrelated theoretical contributions. First, it advances heritage interpretation theory by demonstrating how digital media can operationalize interpretive principles within living cultural heritage systems, particularly in contexts where human interpretive resources are limited. Second, it enriches edutourism literature by empirically showing how interactive digital tools can transform heritage tourism from predominantly visual consumption into structured educational engagement. Third, it contributes to technology acceptance theory by validating core TAM constructs in a cultural heritage tourism setting and highlighting the central role of usability, content relevance, and contextual quality in shaping visitor acceptance of digital interpretation media.

Conclusions

This study confirms that tourists' limited comprehension of Subak's cultural values represents a critical challenge for heritage tourism management in Jatiluwih. While most visitors are primarily motivated by scenic appreciation, their understanding of the Tri Hita Karana philosophy and the cultural practices underlying the Subak irrigation system remains minimal. These findings, corroborated by Focus Group Discussions, further reveal structural constraints, including limited guide availability, language barriers, and inconsistencies in information delivery, which collectively weaken the effectiveness of conventional interpretation practices.

By employing a Research and Development approach encompassing preliminary research, product development, and limited trials, this study formulates a digital heritage interpretation strategy through the development of an interactive digital book integrated with QR code technology. The results demonstrate that this medium is accessible, engaging, and beneficial for both tourists and local stakeholders. Within a heritage interpretation framework, the digital

book effectively communicates cultural meanings at both emotional and intellectual levels. From an edutourism perspective, it enhances tourism experiences by embedding structured educational value into recreational activities. Furthermore, analysis grounded in the Technology Acceptance Model confirms that tourists' acceptance of the digital book is strongly influenced by perceived usefulness and perceived ease of use, indicating its suitability for contemporary, technology-oriented visitor segments.

Theoretical, Practical, and Policy Implications

Theoretically, this study advances the integration of heritage interpretation, edutourism, and technology acceptance theories by proposing an empirically grounded model of digital heritage interpretation tailored to living cultural landscapes. It demonstrates how digital media can operationalize interpretive principles while simultaneously supporting educational tourism objectives and technology adoption dynamics.

Practically, the interactive digital book provides a standardized and flexible interpretive tool that supports consistent knowledge delivery, assists tour guides, and enhances visitor learning experiences. As a digital archive of Subak knowledge, it also contributes to cultural preservation by facilitating intergenerational knowledge transmission and mitigating the risk of cultural erosion. From a policy perspective, the findings suggest that digital interpretation should be systematically incorporated into heritage tourism management strategies, particularly in destinations facing human resource limitations and linguistic diversity. Institutional support for digital interpretation initiatives can strengthen heritage sustainability while enhancing destination competitiveness.

Recommendations and Future Research

Several recommendations emerge from this study. First, the digital book should be disseminated through official destination platforms, social media channels, and partnerships with travel agencies to maximize accessibility and reach. Second, it should be institutionalized as a standardized interpretive reference for tour guides to ensure informational consistency and accuracy. Third, sustained involvement of local communities in content development is essential to preserve cultural authenticity and ensure contextual relevance.

This study acknowledges certain limitations. The use of accidental sampling may introduce sampling bias, and the limited trial phase involved a relatively small number of participants. In addition, the research focused primarily on digital books, while more advanced digital technologies such as mobile applications, augmented reality, and virtual reality were not examined in depth. Future research should therefore conduct longitudinal assessments to evaluate long-term impacts on tourists' knowledge, attitudes, and conservation-oriented behaviors, and further explore the integration of advanced digital technologies to support smart and sustainable heritage tourism governance.

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References

- Abrahams, E., & Bama, H. K. N. (2023). Study Abroad Programmes As an Edutourism Segment for South African Universities. *Geojournal of Tourism and Geosites*, 51(January), 1775–1785. <https://doi.org/10.30892/gtg.514spl01-1173>
- Ardana, P. D. H., Suparwata, D. O., Sudrajat, A., Chatun, S., & Harsono, I. (2024). The Role of Bali's Traditional Subak Farming System in the Preservation of Natural and Cultural Resources. *West Science Nature and Technology*, 2(01), 31–38. <https://doi.org/10.58812/wsnt.v2i04.754>
- Borg, W. R., & Gall, M. D. (1983). *Educational Research: An Introduction* (4 ed.). Longman.

- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, 13(3), 319–339. <https://doi.org/10.2307/249008>
- Dwipradnyana, I. M. (2019). Tantangan Berat Regenerasi Petani Bali Dalam Mempertahankan Subak Sebagai Warisan Budaya Dunia. *Agrica*, 10(2), 75–82. <https://doi.org/10.37478/agr.v10i2.199>
- Geria, I. M., Sumardjo, N., Sutjahjo, S. H., Widiatmaka, N., & Kurniawan, R. (2019). Subak sebagai Benteng Konservasi Peradaban Bali. *Amerta*, 37(1), 39. <https://doi.org/10.24832/amt.v37i1.39-54>
- Halim, D. K., Pramesti, D. S., & Permatasari, D. N. C. (2023). E-administration for collaborative governance body of green tourism villages in realizing smart villages in Bali. *IOP Conference Series: Earth and Environmental Science*, 1263(1). <https://doi.org/10.1088/1755-1315/1263/1/012017>
- Hastuti, P. T., Shinta, J. A., Khamidayati, S., Pramayuda, K., & Kharisma, B. (2023). Strategi Pengembangan Digitalisasi Desa Wisata: Studi Kasus Desa Jatiluwuh, Kabupaten Tabanan Provinsi Bali. *Jurnal Ilmiah Cakrawarti*, 6(2). <https://doi.org/10.47532/jic.v6i2.841>
- Kraja, A., Goga, I., & Kapaj, A. (2025). The impact of smart tourism on improving business performance. *Edelweiss Applied Science and Technology*, 9(7), 2297–2310. <https://doi.org/10.55214/2576-8484.v9i7.9156>
- Moreno-Melgarejo, A., García-Valenzuela, L. J., Hilliard, I., & Pinto-Tortosa, A. J. (2019). Exploring Relations between Heritage Interpretation, Visitors Learning Experience and Tourist Satisfaction. *Czech Journal of Tourism*, 8(2), 103–118. <https://doi.org/10.2478/cjot-2019-0007>
- Nowacki, M. (2021). Heritage interpretation and sustainable development: A systematic literature review. *Sustainability (Switzerland)*, 13(8). <https://doi.org/10.3390/su13084383>
- Polukhina, A., Sheresheva, M., Napolskikh, D., & Lezhnin, V. (2025). Digital Solutions in Tourism as a Way to Boost Sustainable Development: Evidence from a Transition Economy. *Sustainability (Switzerland)*, 17(3). <https://doi.org/10.3390/su17030877>
- Pramesti, D. S. (2024). Pembuatan Video Produk Unggulan Desa Sebagai Media Promosi Desa Jatiluwih Di Kabupaten Tabanan, Bali. *Bina Cipta*, 3(1), 43–52. <https://doi.org/10.46837/binacipta.v3i1.49>
- Widari, D. A. D. S. (2015). Perkembangan Desa Wisata Jatiluwih Setelah Unesco Menetapkan Subaknya Sebagai Bagian Dari Warisan Budaya Dunia. *Jurnal Master Pariwisata (JUMPA)*, 2(1 Juli), 61–78. <https://doi.org/10.24843/jumpa.2015.v02.i01.p04>
- Sumarmi, Bachri, S., Irawan, L. Y., & Kurniawati, E. (2020). Cultural ecology of osing in development of Kemiren Tourist Village as international tourist attraction. *IOP Conference Series: Earth and Environmental Science*, 485(1), 1–10. <https://doi.org/10.1088/1755-1315/485/1/012017>
- Susanto, D., Nugroho, A., Wiyono, R., Hidayat, S., Vokasi, U., & Gadjah, M. (2021). Potensi Ekoeduwisata Pendukung Field Research Centre UGM di Kulonprogo. *Gorontalo: Journal of Forestry Research*, 4(1), 1–14.
- Sutawan, N. (2012). Eksistensi Subak di Bali: Mampukah Bertahan Menghadapi Berbagai Tantangan. *SOCA: Jurnal Sosial Ekonomi Pertanian*, 1(2), 1–10. <https://ojs.unud.ac.id/index.php/soca/article/view/3991/2981>
- Utari, N. M. A. D., Wijaya, N., & Sudana, I. P. (2021). Motivasi Dan Persepsi Wisatawan Nusantara Berkunjung Ke Jatiluwih, Tabanan. *Jurnal IPTA*, 9(2), 285. <https://doi.org/10.24843/ipta.2021.v09.i02.p06>
- Windia, W. (2018). Kebertahanan Subak di Era Globalisasi. *Jurnal Bali Membangun Bali*, 1(2), 125–144. <https://ejournal.baliprov.go.id/index.php/jbmb/article/view/27/23>
- Windia, W., Pusposutardjo, S., Sutawan, N., Sudira, P., & Arif, S. S. (2005). Sistem Irigasi Subak dengan Landasan Tri hita Karana (THK) Sebagai Teknologi Sepadan dalam Pertanian Beririgasi. *SOCA (Socio-Economic of Agriculture and Agribusiness)*, 5(3), 5(3). <https://ojs.unud.ac.id/index.php/soca/article/view/4095/3082>