AN 8I FRAMEWORK FOR AI-BASED HERITAGE STORYTELLING: A DESIGN SCIENCE APPROACH FOR COMMUNITY TOURISM IN PECINAN SEMARANG

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ABSTRACT

The need for innovative digital solutions in community-based heritage tourism for engaging visitors with the local culture and enhancing the local identity. However, there are many Tourism Awareness Groups (Pokdarwis) which still must depend on traditional approaches to storytelling, which restrict the provision of interactive and engaging heritage experiences. This study recommends that the design of AI-based heritage storytelling in community tourism should be based on the 8I Framework (Interactive, Informative, Immersive, Inclusive, Intelligent, Inspiring, Innovative, and Impactful). The study adopts a Design Science Research (DSR) method to first identify the challenges of Pokdarwis Pecinan Semarang, then to create a conceptual design of an AI storytelling system using QR codes that provides location-based video stories, and then to formulate a design framework for the next steps of digital tourism development. The proposed framework was developed and revised based on the discussions with the Chair of Pokdarwis Pecinan Semarang to ensure its relevance, feasibility, and community needs. The framework provides a handy reference for the introduction of AI technology in heritage tourism, enabling digital innovation, sustainable tourism, and community empowerment. The framework suggested in this study could be followed in future research and its effectiveness could be tested empirically through real implementation to improve local communities' experience, culture and positive impacts.

Keywords: Artificial Intelligence, Heritage Tourism, Digital Storytelling, Community Empowerment, Design Science Research.

1. INTRODUCTION

Heritage tourism has emerged as a powerful means to sustain the cultural identity and to generate economic opportunities for the local communities. Heritage tourism preserves not only physical heritage like historic structures and monuments, but also intangible cultural heritage, such as local history, culture, traditions, and rituals, and collective memories. With the advent of Artificial Intelligence (AI) and Generative AI, the digital transformation of heritage tourism has reached new heights, offering the potential for interactive storytelling, multilingual interpretation, customised visitor experiences, and intelligent cultural preservation. Artificial Intelligence (AI) and Generative AI have driven heritage tourism to a new level of digital transformation, promising interactive storytelling, multilingual interpretation, customised visitor experiences, and intelligent cultural preservation. The application of AI in tourism technologies has been shown to enhance visitor experiences, accessibility, destination competitiveness, and sustainable tourism management practices in recent research (Cuomo et al., 2024; Koo et al., 2025; Suanpang & Pothipassa, 2024) Foundational smart tourism research has similarly emphasized that the integration of information and communication technologies at the destination level can enrich visitor experience, resource allocation, and marketing effectiveness (Buhalis & Amaranggana, 2014; Gretzel et al., 2015)

The Pecinan/Chinatown neighbourhood in Semarang is one of the most visible urban heritage sites in Indonesia, which contains several historical trading corridors, centuries of Chinese Indonesian history, religious festivals and temples (klenteng), as well as traditional architecture. The Tourism Awareness Group (*Kelompok Sadar Wisata* or *Pokdarwis*) is a group of local citizens who are responsible for promoting tourism, preserving cultural heritage, and interpreting the history of their area for tourists. Being a representative of community-based tourism, Pokdarwis is a pivotal player in the continuity of local heritage to be relevant and approachable to both local and international tourists. In spite of its culture value, the interpretation of this heritage in Pecinan Semarang is still not well supported by printed information boards and volunteer tour guide. This traditional method can lead to low levels of visitor interaction, weak narrative quality, poor accessibility for independent visitors and challenges to the delivery of historical narratives. They become more apparent in the younger guests who are looking for more than a display of information; they want something interactive, multimedia-rich, and technology-enhanced.

The process of needs assessment was carried out by observing the field and discussing with the Pokdarwis Pecinan Semarang Chair and members in order to gain an understanding about the challenges. The observations highlighted

several practical challenges, such as the scarcity of digital storytelling media, reliance on the availability of guides, the delivery of historical content and the potential for using AI to enrich visitors' experiences without losing the essence of local stories. Furthermore, the following sites of heritage sites were determined within the Pecinan tourism corridor that could be used for the creation of AI stories and digital interpretation.



Figure 1. Field observation, and stakeholder involvement with Pokdarwis Pecinan Semarang.

AI has provided new opportunities for heritage destinations to provide more engaging and meaningful visitor experiences in recent years. Through the use of AI technology, digital storytelling can also be used to create multimedia content, provide adaptive storytelling, communicate in multiple languages and offer interactive experiences that can enhance the emotional and cognitive engagement of visitors to cultural heritage sites. There is evidence that AI, smart tourism technologies and immersive digital experiences are able to enhance cultural interpretation, visitor satisfaction, and sustainability of destinations (Cuomo et al., 2024; Papathanassis, 2025; Suanpang & Pothipassa, 2024). Meanwhile, the community-based tourism research has always highlighted that digital innovation should enhance the role of the community, not weaken it, which in this case is the role of community organizations as cultural agents like Pokdarwis (Herdiana, 2019; Prafitri & Damayanti, 2016).Generative AI has further been shown to support adaptive, multi-platform storytelling that strengthens emotional engagement with cultural narratives (Ilieva, 2024; Kasemsarn & Nickpour, 2025), and collaborative human-AI narrative generation has been found to help preserve the authenticity of cultural heritage content (He et al., 2025).

While there have been numerous studies concerning the use of AI in tourism, immersive visitor experiences and smart tourism technologies, few studies have proposed an integrated conceptual framework, covering both the engagement of visitors and the interpretation of heritage, as well as AI and the empowerment of the community. While there are several studies on the technological implementation or technology acceptance, studies which provide practical design guidance for community organizations that want to incorporate AI into sustainable development of heritage tourism are limited (Koo et al., 2025). Therefore, a comprehensive framework is needed which could provide conceptual design and future implementation of AI-based heritage storytelling in community managed tourism destinations.(Hasanein et al., 2026). In response to this, this study suggests the 8I Framework, which includes Interactive, Informative, Immersive, Inclusive, Intelligent, Inspiring, Innovative, and Impactful dimensions, as a strategic framework for developing AI-based community tourism heritage storytelling. The approach combines elements of artificial intelligence, smart tourism, digital storytelling, heritage interpretation, and community empowerment, and is synthesized in a conceptual framework that can form the basis for future digital transformation projects. The concept is presented in an octagonal form that is taken from the Bagua as a cultural symbol of Pecinan Semarang, which represents balance and integration between the eight dimensions and only a metaphorical representation.



Figure 2. The proposed framework (8I) for the use of AI in Community Tourism for Heritage Storytelling

Based on the Design Science Research (DSR) approach (Hevner et al., 2004), this research focuses on identifying the problem faced by Pokdarwis Pecinan Semarang, proposing the 8I Framework and creating a conceptual architecture for the AI heritage storytelling system with QR code that can provide location-based multimedia narratives. Instead of providing a complete technological solution, this study offers a general conceptual framework that can be used in the support of digital innovation, sustainable heritage tourism and community empowerment and serves as a basis for further implementation and empirical research.

2. METHOD

The methodology used in this study is Design Science Research (DSR) proposed by Hevner et al. (2004) to develop a conceptual framework for community tourism's AI-based heritage storytelling. It was chosen as the subject of this study as the primary goal of this study is to design a conceptual artifact that is able to resolve a practical problem for CBOs, rather than to assess an implemented technological system. The proposed artifact is the 8I Framework which combines elements of artificial intelligence, digital storytelling, smart tourism and community empowerment into a single framework of heritage tourism.
The research proposed four successive stages as shown in Figure 3.

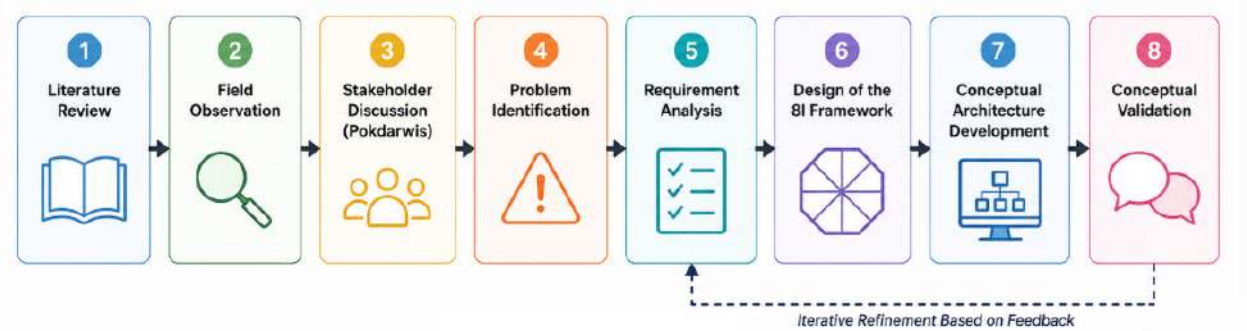

Figure 3. Design Science Research (DSR) approach to research methology

Problem Identification
The first stage was to find out the problems in narrating heritage in the Pecinan Semarang tourism area. The data collection activities taking place consisted of three complementary activities: (1) literature study on AI, Digital Storytelling, Smart Tourism, and Community Based Tourism; (2) field observations at several heritage sites in Pecinan Semarang; and (3) discussions with the Chair and members of the Pokdarwis Pecinan Semarang. The activities highlighted a number of key challenges, such as a lack of dynamic information boards, few tour guides, poor quality historical content, and increasing demand for interactive digital tourist experiences.

Requirement Analysis and Framework Design
The second stage was the process of converting the identified problems into design requirements for the AI-based heritage storytelling. Literature review and stakeholder discussions were used to arrive at the characteristics of an effective digital storytelling framework. This analysis considered eight strategic dimensions: visitor interaction, information quality, immersive experience, accessibility, AI capability, cultural inspiration, innovation, and community impact. In response to the requirements, the proposed 8I Framework was developed, which includes the dimensions of Interactive, Informative, Immersive, Inclusive, Intelligent, Inspiring, Innovative and Impactful. These dimensions represent design principles to consider when designing AI-assisted applications for heritage tourism. In addition to the conceptual framework, a conceptual architecture of a QR code-based AI story telling system was also designed to show how this system can be applied in practice. The architecture represents how visitors can access location-based heritage stories by means of the AI-generated multimedia content without having to download a dedicated mobile app.

Conceptual Validation
Conceptual validation of the proposed framework was carried out in the final stage. The process of the system test was not conducted, but the system was evaluated through iterative discussion with the Chair of Pokdarwis Pecinan Semarang which is related to the relevance, feasibility, and community needs. The results of these discussions were fed back into the framework with refinement and improvement to make sure the proposed dimensions are sufficient to include practical considerations in community-based heritage tourism. The validation process enhances the relevance of the framework as a strategic tool for future implementation of AI in heritage destinations.(Creswell, 2017).

3. RESULTS AND DISCUSSION

Identified challenges in Heritage Storytelling

The Pokdarwis Pecinan Semarang was chosen to focus on the field observations and stakeholder discussions revealed several challenges in providing heritage interpretation to the visitors. The Pecinan district has a lot of historical and cultural values, but the manner of storytelling is still standard: printed information boards and volunteers as tour guides. Thus the experiences of visitors can differ from the experiences of others, and independent tourists are not provided with much context on their own visits.

The four great challenges uncovered by the needs assessment are described below. First, heritage information is mainly conveyed through static media, which limits visitor interaction, especially among younger generations used to digital media. Second, storytelling quality is highly variable among individuals, with differences in the quality of stories on different tours. Third, digital content is not accessible for international visitors due to the fact that there is not enough multilingual content. Lastly, there is low use of digital technologies, which limits opportunities to enhance the visitor experience, to preserve the culture and to involve the community.



Figure 4. Observations in the field at the places of heritage in Pecinan Semarang.

These results align with already published research which shows that the destination is more competitive and has better visitor engagement when interpretation is more interactive, using technology (Cuomo et al., 2024; Papathanassis, 2025) Likewise, AI-powered tourism has emerged as a successful strategy to enhance accessibility, personalization, and cultural interpretation in smart tourism systems (Koo et al., 2025; Suanpang & Pothipassa, 2024).

Table 1. Identified Challenges in Heritage Storytelling

Challenge	Current Condition	Expected Improvement
Limited contextual information	Visitors receive limited contextual information	Interactive digital storytelling
Relying on tour guides	Storytelling varies among guides	Consistent AI-supported storytelling
Limited multilingual content	Foreign visitors face language barriers	Multilingual AI interpretations
Limited digital engagement	Low interaction among younger visitors	Immersive multimedia experiences

Proposed 8I Framework

This paper argues for the 8I Framework as a strategic approach for community tourism with AI-based heritage storytelling, based on the identified challenges and synthesis of existing literature. The proposed framework aims to offer a conceptual model that combines the elements of visitor experience, artificial intelligence, digital innovation, heritage interpretation, and community empowerment, a combination not explored in any other studies, which mainly focus on technological implementation or visitor acceptance.

The framework has eight dimensions that highlight complementary aspects:

- **Interactive**, enabling two-way engagement between visitors and heritage content.
- **Informative**, delivering accurate, contextual, and meaningful cultural information.
- **Immersive**, creating engaging storytelling experiences through multimedia technologies.

- **Inclusive**, ensuring accessibility for visitors with different backgrounds and language preferences.
- **Intelligent**, utilizing AI to generate adaptive and personalized heritage narratives.
- **Inspiring**, encouraging appreciation and preservation of local culture.
- **Innovative**, introducing creative approaches to heritage interpretation through digital technologies.
- **Impactful**, generating long-term cultural, social, and economic benefits for community-based tourism.

Rather than functioning as independent dimensions, the eight components interact to create a holistic visitor experience while supporting sustainable tourism development and community empowerment.

Table 2. Description of the Proposed 8I Framework

Dimension	Description	Expected Contribution
Interactive	Enables active visitor participation	Higher visitor engagement
Informative	Provides contextual heritage information	Better cultural understanding
Immersive	Creates engaging digital experiences	Stronger emotional connection
Inclusive	Supports multilingual and accessible content	Wider visitor accessibility
Intelligent	AI-assisted adaptive storytelling	Personalized visitor experience
Inspiring	Encourages appreciation of heritage	Cultural preservation
Innovative	Introduces new storytelling approaches	Tourism competitiveness
Impactful	Creates long-term community benefits	Sustainable community tourism

Conceptual Architecture of AI Based Heritage Storytelling

In order to demonstrate the applicability of the proposed framework, a conceptual architecture of an AI-based heritage storytelling system is created. The architecture starts by having visitors scan a QR code placed at one of the heritage sites with their smartphone. The QR code takes visitors to a storytelling platform in the web, without the need of a dedicated app. The platform fetches location-specific data from a heritage knowledge repository, overlays AI-generated narration and media content and creates interactive storytelling experiences.

Its conceptual architecture prioritizes scalability and accessibility, enabling community groups like Pokdarwis to add to or modify the heritage content without having to have a lot of technical expertise. Moreover, the architecture provides the capability to integrate multilingual narration, digital avatars, augmented reality and personalized visitor recommendations in the future. This browser-based, QR-triggered design follows earlier evidence that combining Web technologies, augmented reality, and QR codes can lower access barriers and enhance the tourist guidance experience without requiring dedicated applications (Rodríguez Fino et al., 2013), and echoes recent implementations of generative AI virtual assistants for location-based heritage interpretation (Sangamuang & Puritat, 2025)

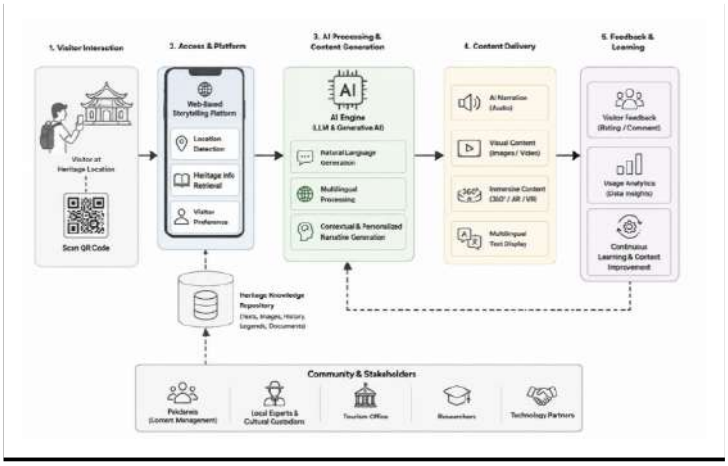

Figure 5. Proposed system for heritage storytelling using AI in conceptual architecture.

The proposed 8I Framework builds upon the previous research on smart tourism by combining technological innovation, community empowerment and heritage preservation. The existing research has mainly focused on the adoption of AI in tourism, immersive tourism experiences or smart destination technologies, but not on the convergence of these three aspects (Cuomo et al., 2024; Koo et al., 2025; Papathanassis, 2025). This study, on the other hand, places community-based organizations, especially Pokdarwis, as key actors in digital transformation.

The proposed framework is different from the existing conceptual models because of the addition of the Impactful

dimension. The proposed framework aims not only to assess the success of the technology based on the satisfaction of visitors and/or the usability of the system but to also measure other impacts such as cultural conservation, community involvement, strengthening of institutional capacities and development of sustainable tourism. This is in line with the principle of community based tourism, which emphasizes the empowerment of the community as well as technological innovation (Herdiana, 2019; Prafitri & Damayanti, 2016). This is also consistent with evidence from Indonesian tourism villages showing that community participation and strengthened institutional capacity translate technological and cultural potential into tangible economic outcomes such as increased household income, local employment, and community welfare (Indrianti et al., 2019; Putra & Ariana, 2021; Siregar et al., 2024). At the same time, sustaining such benefits requires balancing novelty-seeking with visitors' concerns about authenticity, a tension previously documented in smart tourism technology adoption (Goo et al., 2022). Furthermore, the framework illustrates the way in which local communities can be an enabler for AI and not a replacement. AI can contribute to digital storytelling and the interpretation of visitors, but it is crucial to remember that the community is the main source of cultural authenticity and historical knowledge. The partnership between AI and community groups helps promote sustainable and culturally relevant heritage tourism.

Table 3. Previous studies comparison

Study	AI	Heritage	Community	Integrated Framework
Cuomo et al. (2024)	✓	✓	–	–
Suanpang & Pothipassa (2024)	✓	–	–	–
Koo et al. (2025)	✓	✓	–	–
This Study	✓	✓	✓	✓ (8I Framework)

Future Development Opportunities

The suggested framework can serve as a reference framework for subsequent implementation of AI in community-based tourism destinations, offering tourism managers an insight into the application of AI in community-based tourism. Continued research could lead to a fully functional storytelling platform with QR code technology, featuring generative AI capabilities, multiple language narration options, digital avatars, augmented reality and personalised visitor suggestions. The effectiveness for each of the proposed 8I Framework dimensions must be evaluated through empirical validation with tourists, local community and destination managers. Future digital storytelling initiatives may also draw on emerging work profiling domestic tourist segments for more targeted, AI-supported marketing communication (Puspita et al., 2025) as well as broader perspectives on social media as a channel for community- nasrudriven cultural promotion (Nasrullah, 2015)

The framework can be customized for tourism villages, historical areas, museums, and other cultural sites aiming to combine digital innovations and community empowerment. Future work such as these would allow a quantitative evaluation of the framework applicability, and at the same time help in the development of sustainable tourism in different cultural environments.

4. CONCLUSION

The conceptual framework of designing community tourism AI-based heritage storytelling in this study is the 8I Framework. The framework has been designed following the Design Science Research (DSR) methodology and combines eight complementary dimensions (Interactive, Informative, Immersive, Inclusive, Intelligent, Inspiring, Innovative, and Impactful) that will enhance the digital maturity of the heritage tourism sector in terms of cultural authenticity and community engagement. The framework focuses on the challenges that were found in Pecinan Semarang, such as the lack of digital storytelling media, dependence on tour guides, inconsistent interpretation of the heritage and the need for interaction with the visitor in presenting a story. The proposed framework does not prioritize the use of Artificial Intelligence (AI) as a substitute for the local community but is rather AI as a facilitator technology for the preservation of cultural knowledge, enhancing visitor experiences, and creating sustainable tourism development.

The main contribution of this study is the development of an integrated conceptual framework, based on the union of artificial intelligence, digital storytelling, smart tourism, heritage interpretation and community empowerment in a single design model. The proposed 8I Framework differs from earlier research that mainly concentrates on technological implementation or visitor acceptance by focusing on how community organisations can play a strategic role in supporting the adoption of AI in heritage tourism destinations. Future research should focus on implementing the proposed conceptual architecture in real world heritage tourism contexts and test each dimension of the 8I Framework empirically, quantitative and qualitative, through an approach involving tourists, local

communities and tourism managers. The development of multilingual generative AI, digital avatars, augmented reality, and custom recommendation systems to enhance heritage storytelling experiences could also be explored in future studies. The framework can also be customized and applied to other heritage sites and tourism villages to assess its potential for wider use and impact on sustainable community development.

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