REVITALIZING HISTORICAL TOURISM DESTINATION THROUGH GAMIFICATION AND STORYTELLING: A CASE STUDY OF THE WARUNGBOTO SITE IN YOGYAKARTA

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ABSTRACT

This study examines the potential development of gamification and storytelling in revitalizing historical tourism destinations at the Warungboto Site, Yogyakarta. The research aims to develop a concept for historical site development by integrating digital technology and gaming elements to enhance tourist experiences. Through analyzing the site's strengths in natural, historical, and spiritual aspects, the "Rediscover The Lost Garden" concept was developed to facilitate site exploration and interpretation through interactive games and puzzles. The research employed a qualitative approach with case study design, involving data collection through historical literature review, field observations, and in-depth interviews with 12 key informants. The findings identified three main site strengths that can be optimized through gamification: (1) natural elements comprising springs and historical gardens, (2) historical value from the era of Sultan Hamengku Buwono II, and (3) spiritual aspects reflected in the building's architecture and functions. The gamification implementation is designed across four exploration zones with progressive difficulty levels, utilizing augmented reality technology to digitally reconstruct site conditions. A reward system based on points and virtual badges is implemented to encourage comprehensive exploration. This research contributes to the development of a gamification model for historical tourism destinations that integrates digital technology while preserving heritage values.

Keywords: Gamification; Heritage Tourism; Augmented Reality in Tourism; Digital Story Telling; *Situs Warungboto*

ABSTRAK

Penelitian ini mengkaji potensi pengembangan gamifikasi dan storytelling *dalam merevitalisasi destinasi wisata sejarah di Situs Warungboto, Yogyakarta. Studi ini bertujuan untuk mengembangkan konsep pengembangan situs sejarah dengan mengintegrasikan teknologi digital dan permainan untuk meningkatkan pengalaman wisatawan. Melalui analisis kekuatan situs dalam aspek alam, sejarah, dan spiritualitas, konsep "Rediscover The Lost Garden" dikembangkan untuk memfasilitasi eksplorasi dan interpretasi situs melalui permainan dan teka-teki interaktif. Penelitian menggunakan pendekatan kualitatif dengan studi kasus, melibatkan pengumpulan data melalui tinjauan literatur sejarah, observasi lapangan, dan wawancara*

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mendalam dengan 12 informan kunci. Hasil penelitian mengidentifikasi tiga kekuatan utama situs yang dapat dioptimalkan melalui gamifikasi: (1) elemen alam berupa mata air dan taman bersejarah, (2) nilai sejarah dari era Sultan Hamengku Buwono II, dan (3) aspek spiritualitas yang tercermin dalam arsitektur dan fungsi bangunan. Implementasi gamifikasi dirancang dalam empat zona eksplorasi dengan tingkat kesulitan bertahap, menggunakan teknologi augmented reality untuk merekonstruksi kondisi situs secara digital. Sistem penghargaan berbasis poin dan lencana virtual diterapkan untuk mendorong eksplorasi menyeluruh. Penelitian ini berkontribusi pada pengembangan model gamifikasi destinasi wisata sejarah yang mengintegrasikan teknologi digital dengan tetap mempertahankan nilai-nilai sejarah.

Kata Kunci: *Gamifikasi; Wisata Sejarah;* Augmented Reality *dalam Pariwisata:* Digital Storytelling; *Situs Warungboto*

INTRODUCTION

The advancement of digital technology has significantly transformed various aspects of life, including the tourism sector. One notable innovation is the application of gamification in the development of tourist destinations. According to data, the number of video game players is projected to exceed 3 billion by 2023 (Ahlstén et al., 2023), highlighting the immense potential for integrating gaming elements into travel experiences. Video games have proven effective in promoting tourism through immersive virtual experiences, showcasing the landscapes, cultures, and historical heritage of various regions (Corrêa & Kitanoa in Ahlstén et al., 2023).

In the context of historical tourist destinations, gamification offers an innovative solution to enhance visitor appeal and experience. Historical sites often struggle to attract tourists, particularly younger generations, despite their significant historical and cultural value. This challenge arises from a lack of interactivity and active engagement among visitors in exploring the historical values embedded within these sites (Xu et al. in Mileva et al., 2021). Warungboto site in Yogyakarta, as a heritage site from the era of the Islamic Mataram Sultanate, faces challenges in engaging tourists, particularly the youth, in understanding its history. Despite its high historical value as a former rest house of Sultan Hamengku Buwono II, the site has not optimised visitor engagement or the communication of its historical values. It is often visited primarily as a photo spot rather than a place for historical understanding.

The implementation of gamification can serve as a strategic solution, given its ability to create richer tourist experiences and enhance visitor satisfaction (Neuhofer et al. in Mileva et al., 2021). Through game elements, tourists can be motivated to explore historical sites more deeply (Deterding et al., 2011). Technological advancements, such as Augmented Reality (AR) and Virtual Reality (VR), open up opportunities to virtually reconstruct the conditions of historical sites during their peak, providing a more personal and immersive experience for visitors (Xu et

al. in Mileva et al., 2021). Education and preservation are critical focuses in the development of historical tourist destinations. Gamification can offer educational benefits regarding history and culture in an engaging manner (Deci & Richard in Mileva et al., 2021). In the context of Warungboto, the application of serious games can assist tourists in understanding the historical and architectural significance of the site, as well as its role in the political dynamics of the Islamic Mataram Sultanate in the 18th century.

The urgency of this research is based on several factors. Firstly, there is an urgent need to revitalise historical tourist destinations to remain relevant in the digital age. Secondly, the declining interest of younger generations in historical heritage necessitates innovative approaches to conveying cultural values. Thirdly, the economic potential of technology-based historical tourism development has yet to be fully realised. This research aims to develop an effective gamification model for Warungboto, taking into account the unique characteristics of the historical site and contemporary tourist preferences. It will analyse the potential application of gamification in enhancing the tourist experience at Warungboto and design narrative themes that can be utilised within the gamification framework. Through this research, it is hoped that an innovative concept for developing historical tourist destinations can be produced, integrating digital technology while preserving the authenticity and cultural values inherent in these sites. The successful implementation of this model

at Warungboto could serve as a best practice example for the development of similar historical tourist destinations in Indonesia.

LITERATURE REVIEW

Gamification has evolved into an innovative approach that offers significant potential in transforming the tourism industry. This concept, defined as the application of game design elements in non-game contexts, has demonstrated effectiveness in enhancing visitor engagement and loyalty, as well as enriching their travel experiences (Mileva et al., 2021). Through the integration of digital technology and game mechanics, gamification opens new dimensions in how tourists interact with tourist destinations.

In its implementation, gamification can be applied across three main phases of the tourist journey: before, during, and after the visit. Particularly during the visit phase, location-based applications play a crucial role in shaping the tourist experience. The increasingly complex motivations of tourists in seeking meaningful experiences can be met through game design elements that relate to self-determination theory, encompassing three fundamental needs: relatedness, competence, and autonomy (Mileva et al., 2021). This indicates that the success of gamification relies not only on external elements such as points systems and badges but also on intrinsic factors that encourage deep engagement.

Case studies in various tourist destinations illustrate the effectiveness of the gamification approach. In Sofia, Bulgaria, the implementation of the

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applications "Sofia's Centre: 7 Millennia of Secrets" and "Ancient Serdica Riddles" demonstrates how gamification can enhance tourist engagement through puzzle-solving along designated routes (Tomasevic & Pavicevic, 2020). Meanwhile, the TRIPMENTOR project in the Attica region of Greece adopted the Octalysis model, integrating eight gamification parameters to create a personal and memorable tourist experience (Roinioti et al., 2022).

Combining storytelling with gamification in the tourism context can create unique and engaging experiences for tourists. When game elements are applied to compelling narratives, tourists can engage emotionally and intellectually, thereby enhancing their satisfaction and involvement. According to Liberato et al. (2023), this combination can increase the appeal of destinations and add value to the tourist experience.

In the context of destination development, gamification has proven effective as a marketing tool and a medium for learning. A study in Montenegro revealed that 86% of tourists utilise various types of games, indicating substantial potential for implementing gamification in learning about tourist destinations (Tomasevic & Pavicevic, 2020). This is further supported by research in Finland, which showed that private development organisations are generally more enthusiastic about adopting gamification concepts compared to public organisations, although challenges related to funding and maintenance persist (Ahlstén et al., 2023).

Technological advancements such as Augmented Reality (AR) and Virtual Reality (VR) have expanded the possibilities for implementing gamification in tourism. Location-based applications that integrate this technology can provide freedom of movement, individual pacing in completing challenges, and thematic choices tailored to tourists' interests (Jang & Hsieh, 2021). In cultural heritage sites like the Sakkara tourist complex in Egypt, gamification has successfully combined game elements with real-world tourism experiences, encouraging tourists to engage more deeply with the destination while learning about the local history and culture (De Freitas Verdugo et al., 2022).

Gamification has emerged as an innovative approach to enhancing historical tourism experiences by integrating digital game elements into the exploration of historical sites. This approach not only creates more interactive and enjoyable experiences but also facilitates a deeper understanding of cultural heritage values. Through the integration of digital technology and engaging storytelling, gamification can transform how tourists interact with historical sites while respecting and preserving the cultural values inherent in them (Ahlstén et al., 2023).

The implementation of gamification in historical tourism typically involves developing mobile applications that integrate various game elements such as point systems, levels, trophies, badges, and achievements. These applications are designed as information hubs that provide storylines, narratives, and guidance while

facilitating spatial navigation through the integration of digital maps. The structure and content of the game are aligned with human cognitive architecture to facilitate the processing of tourism-related information, enabling users to access and tailor information according to their personal preferences (Widarti & Emanuel, 2020).

Studies indicate that reward elements, competition, and social interaction are crucial components in gamification applications for historical tourism. Regression analyses validate that gamified-experiences correlate positively with increased cultural heritage knowledge, visitor experiences, and user engagement (Elrouby & Kasrawy, 2019). This underscores that gamification can be an effective solution to the challenges faced by traditional historical tourism destinations, such as resource limitations, asset deterioration, and declining visitor interest.

In its implementation, historical tourism gamification must consider three key aspects of enjoyment in the gaming experience—challenge, creativity, and completion. The success of implementation relies on balancing mechanical aspects with meaningful contextual experiences. Personalising experiences becomes a crucial factor, where systems can adjust difficulty levels and content based on the background, interests, and knowledge of individual visitors (Jefferies, 2022).

Research findings indicate that historical heritage gamification can effectively enhance tourist visitation patterns and navigation. Testing across various implementations reveals that users tend to be intrinsically motivated to engage with communication content, with motivation levels reaching 78%. This model successfully creates a more profound and meaningful experience, not only enhancing understanding and appreciation of historical heritage but also fostering social interaction and creating stronger emotional bonds with historical sites (Tomasevic, 2020). Research by Kontogiorgakis et al. (2024) also revealed that the application of gamification in cultural tourism through virtual reality can enhance visitor engagement and learning. By integrating gamification elements such as treasure hunts and interactive storytelling, visitors become active participants in exploring cultural heritage rather than passive observers.

Evaluating gamification implementation using parameters such as usability, satisfaction, and ease of use indicates a high level of acceptance among tourists. Integrated reward systems, such as incentives in the form of entry fee discounts based on achievements in the game, have proven effective in encouraging comprehensive exploration of historical sites. This approach not only creates a more interactive and enjoyable tourism experience but also supports preservation and promotion efforts for historical tourism destinations (Widarti & Emanuel, 2020).

METHOD

This study employs a qualitative approach with a case study design to explore and analyse the potential

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application of gamification at the Warungboto site in Yogyakarta. This approach allows for an in-depth understanding of the socio-cultural phenomena and the complex potential for developing historical tourism.

Data collection is conducted through three complementary techniques: field observation, in-depth interviews, and documentation studies. Field observations are carried out to examine the physical condition of the site, tourist interactions with the site, and the potential for gamification implementation. In-depth interviews are conducted with 12 purposively selected key informants, including site managers from Pokdarwis, local guides, residents around the site, and tourists. Documentation studies involve reviewing historical archives, planning documents, and relevant literature.

Data analysis utilises the interactive analysis model of Miles, Huberman, and Saldana (2014), which includes data condensation, data presentation, and conclusion drawing. Data validation is performed through method and source triangulation, as well as member checking with informants. The research is conducted over six months at the Warungboto site, with attention to ethical research aspects such as formal permissions, informed consent, and respect for local values.

The analytical framework is directed towards identifying site characteristics, analysing the historical narrative of the site, and formulating a gamification model suitable for the local context. The results of the analysis will serve as the basis for developing recommendations for gamification implementation to enhance the tourist experience at the Warungboto site.

RESULT AND DISCUSSION

The Warungboto site, also known as Pesanggrahan Rejowinangun, is a former resting place of the Yogyakarta royal family. It is one of the tourist attractions in Yogyakarta, alongside various other royal heritage sites such as Taman Sari, Alun-Alun, and the Kraton itself. One such rest house is Pesanggrahan Warungboto or Pesanggrahan Rejowinangun. The attraction of this site lies in the ruins of historical buildings with a spring pool inside, which is colloquially referred to by locals as Tuk Umbul. The rest house was built by Sultan Hamengkubuwana II, known for his fondness for building many rest houses from his time as crown prince until his reign (BPCB, 2019).

The identification of strengths possessed by the Warungboto site is conducted by analysing its originality, authenticity, and uniqueness. The originality of Warungboto is assessed by examining the discovery of the current physical structure and its historical past. The authenticity of Warungboto is evaluated based on the philosophical design of the building at that time, with physical symbols found, such as the water source, namely the spring and river, which were the reasons for building the rest house at that location, the hierarchical meaning of the site complex, and the presence of pools and gardens as a form of recreation.

According to the Technical Study Report of Warungboto Site (BPCB DI

Yogyakarta, 2007), there is a research document conducted by OD in 1936 regarding the estimated layout of the Warungboto complex in the past. According to the research findings, the Warungboto site once stretched from west to east, crossing the Gajah Wong River. In the illustration, section number 1 is estimated to be the public square. Section number 2, which is the physical structure still existing today, consists of a mosque, umbul, and pendopo. Section number 3 is estimated to be the eastern pool. Section number 4, which still exists today, is the Gajah Wong River. Section number 5 is part of the rest house whose function is still unknown.
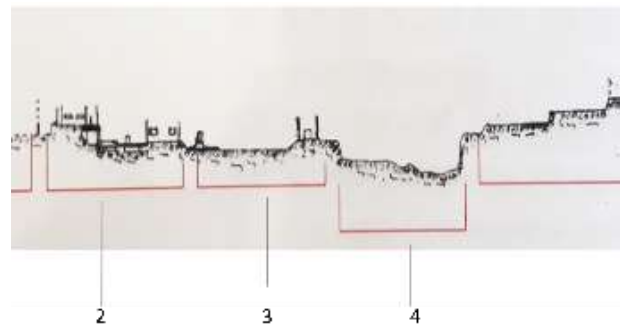

Figure 1. Illustration of the Estimated Layout of Warungboto Site in the Past
(Source: *Situs Warungboto*)

Area number 2 is the core building as it is surrounded by a perimeter fence and contains the main prayer room (the westernmost room of the site). Between the prayer room and the water spring in the core building, there is a narrow underground staircase that branches into two beneath the structure. The spring located in the centre of the core building is contained in a circular pool, which then drains into a rectangular pool to the east, and ultimately flows into the eastern courtyard of the surrounding pool (area number 3), which is currently a large area of bare land. Area number 3 consists of the northern and southern wing buildings. This area features symmetrical structures comprising several rooms. The rooms have large door and window scales. No remnants of the entrance gate have been found in the building on the west side of the river. Overall, the buildings on the eastern side of the river remain uncertain in terms of their utilisation.

Based on the identification of the physical and historical aspects of this site, several significant findings related to Warungboto can be concluded. This site can be interpreted as a garden for the royal family during the reign of Sultan Hamengkubuwono I and II, and it was used for generations thereafter. However, it is not precisely known when this site was completed, abandoned, and subsequently reactivated. As with other locations, the requirement for establishing a rest house is the presence of a garden concept and water sources. In this case, Pesanggrahan Rejowinangun was built in the form of a garden located near the Gajah Wong River. At that time, there were many springs around the

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Gajah Wong River, one of which became the water source for Pesanggrahan Rejowinangun. This rest house can be depicted as a beautiful garden enriched by flowing water that fills the pools leading to the river. The beauty of the garden is also reflected in the majestic rest house structure with unique architecture that is thought to embody many meaningful philosophies.

The Warungboto site is a historical building that has not been fully revitalised physically due to the uncertainty of its original form. The current existence of the site holds a function that is vastly different from the past. However, the character and atmosphere of the building from the past still resonate today. The site's proximity to residential areas provides a distinctive spatial impression for visitors, evoking a sense of past grandeur amidst contemporary modernity.

The identification of three aspects—originality, authenticity, and uniqueness—of the Warungboto site provides an understanding of the strengths of the site, namely nature, history, and spirituality. The spring, garden, and Gajah Wong River contribute to the impression of "nature" as a strength of the Pesanggrahan Rejowinangun. The character of Sultan HB II and the history of the kingdom during that time, along with religious influences, impart a sense of "history" to the site. The overall experience derived from the enigma of the past rest house and the current spatial experience provides a sense of "spirituality" for its visitors.

The Warungboto site has undergone phases of 'neglect' several times due to past wars and has also suffered damage from earthquake disasters. The site has been 'rediscovered' multiple times through restoration efforts starting from the Dutch colonial era to the present by the Cultural Heritage Preservation Office. Nevertheless, the Warungboto site has yet to be fully restored and continues to undergo revitalisation towards its original form. Ongoing research aims to uncover the original layout of Pesanggrahan Rejowinangun as it was when first constructed. Today, the site is portrayed as a 'lost garden'. This depiction of a 'lost garden' encompasses not only the physical setting of the building but also the spirit of the rest house itself. The site is illustrated as a puzzle of a rest house used by the royal family and the king for recreation, enjoyment, and as a place for contemplation and inner peace. The one-eighth portion of the Warungboto site that remains today serves as a symbol of a garden from the past rich in stories to be appreciated in the present.

Rediscover The Lost Garden

The Lost Garden serves as the main concept that can be developed for tourists visiting the Warungboto site. This construct provides an imaginative framework for anyone who comes to envision the rest house of the past. The Lost Garden is a puzzle that will guide tourists to delve into the existence of a 'lost garden' through the concept of rediscovery.

Rediscover is the concept of activities for tourists to enjoy experiences at the Warungboto site, depicted as The Lost Garden. Rediscover can be

interpreted as "discover (something forgotten or ignored) again", finding again something that has been overlooked or forgotten. Rediscover functions as a verb for uncovering the imagination of the Warungboto site as a lost garden due to its neglect or forgetfulness. This concept is appropriate as the Warungboto site has experienced such conditions, being neglected and forgotten for an extended period. In contrast, one of the sites in Yogyakarta that is currently well-managed, visited, and recognised by the public is the Taman Sari site. Warungboto has become a place that is not popular or even unknown regarding its existing condition or history to many people. Even now, the site is more frequently visited for photography activities rather than for exploring its stories and history. Therefore, although restoration efforts have helped reshape this site, the narrative of Pesanggrahan Rejowinangun itself has yet to receive adequate attention.

The concept of Rediscover The Lost Garden translates into activities designed to explore experiences of nature, history, and soul in accordance with the identified strengths of the Warungboto site. These three core strengths are integral to every attraction and supporting element at the Warungboto site. Nature is discovered in the search for the spring, which is the main element of the Warungboto site, as well as the Gajah Wong River, which is part of the site as a whole. The experience of discovering nature is filled with puzzles regarding water flow, its relationship with irrigation for the community, and the condition of the spring, which has dried up due to residential development around the site.

History is found in the quest for the form and function of the buildings and the site complex as a whole. History also encompasses the story of why this rest house was established, the roles of HB I and II as its creators, its functions, and its architectural philosophy. Soul represents the feeling derived from the tourist experience of discovering all the stories, symbols, and philosophies present at the Warungboto site. Through this rediscovery experience, tourists can connect themselves with the Warungboto site as an existence in the present that holds significant values from the past. At the end of the Rediscover The Lost Garden journey: Explore Multiple Experiences in Nature, History, and Soul, tourists are expected to gain not only enjoyment and new insights but also insights from the past that can be applied in the present.

The concept of Rediscover The Lost Garden will be translated into various forms of attractions and tourism support at the Warungboto site. Technology, art, and design will serve as means to convey this concept, in line with global trends. These three media can facilitate the development of the Warungboto site in realising the Rediscover The Lost Garden concept and conveying the core strengths of the site, namely nature, history, and soul. The development concept through these three media is also based on the principles of challenging, different, and insightful.

Challenging means that the attractions align with the puzzle concept established from the outset and are

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capable of providing challenges for tourists to complete the missions assigned through rediscovery. Different implies that the Warungboto site should serve as a unique tourist attraction compared to other sites. Development should not be conducted conventionally but rather follow technological and cultural advancements while educating tourists as consumers through a modern and appealing concept. Insightful means that the site and its overall attraction development should provide insights for all tourists who visit, through their experiences in engaging with Rediscover The Lost Garden.

Exploring the past and present becomes the primary strength for developing this site in the future. Therefore, technology plays a vital role in helping convey the values of the Warungboto site to tourists. There are unique challenges in developing historical sites, one of which is the limitations on physical interventions. Additions or changes in form cannot be

made due to the heritage values that must be preserved. Technology can assist in conveying the intended values, particularly through augmented reality. Augmented reality is a form of technology that merges two or three-dimensional virtual objects with a real condition and projects them into real-time scenarios. This engineering is developed alongside the puzzle concept for Rediscover The Lost Garden through gamification for tourists.

Gamification Design

The gamification design at the Warungboto site is crafted as a journey of rediscovering the lost historical garden through a mobile application based on augmented reality. The game begins at the blue zone, which represents the core building, where players will assume the role of "Time Explorers" tasked with uncovering the mysteries of Pesanggrahan Rejowinangun during its heyday.
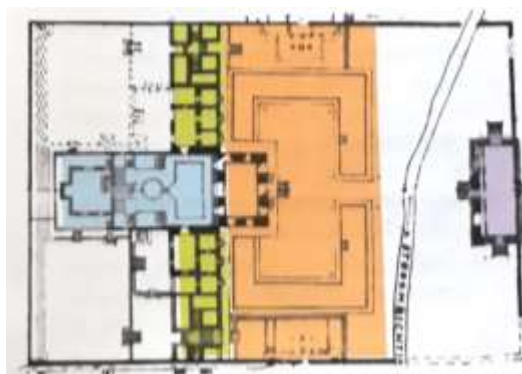

Figure 2. *Pesanggrahan Rejowinangun*
(Source: *Situs Warungboto*)

Upon entering the blue zone, players are welcomed with an introductory narrative explaining that they have travelled back in time to the era

of Sultan Hamengku Buwono II. Through augmented reality, players can view the digital reconstruction of the core building in its intact condition. The first challenge

begins in the prayer room (the westernmost room), where players must solve a puzzle related to the spiritual function of that room. Players will discover clues through hidden architectural symbols, which, when scanned with a smartphone camera, will reveal historical information in holographic form.

After successfully navigating the prayer room, players will be directed to find a secret underground passage connecting the prayer room to the spring. Through AR, players can visualise the water flow from the spring into the circular pool. At this location, players must complete a puzzle related to the ancient irrigation system while learning about the philosophy of water in Javanese culture.

The journey continues to the yellow zone, which encompasses the northern and southern wing buildings. In this area, players will encounter "Fragments of Palace Life"—a series of mini-games showcasing the daily lives of the royal family at the rest house. Through AR, the currently empty rooms will be visualised with furnishings and activities of their past inhabitants. Players must collect virtual artefacts and listen to stories from the "memories" embedded in each room.

Upon entering the orange zone, which is the area of the surrounding pool, players will face the challenge of "Secret Garden." Here, they must reconstruct the garden according to the patterns and philosophies of Javanese royal gardens. Through AR, players can see and place various garden elements such as plants, statues, and ornaments according to the historical clues they have gathered.

The climax of the game occurs in the purple zone across the Gajah Wong River. Players must complete the "Mystery of the Eastern Gate" by discovering and reconstructing the original entrance gate of the rest house adorned with dragon statues. This final challenge integrates all the knowledge gathered about the architecture, philosophy, and history of Warungboto.

Throughout the game, players will earn experience points, virtual badges, and "Historical Fragments" that can be collected. Each achievement will unlock additional content such as historical photographs, ancient documents, and stories from local residents. This reward system not only encourages comprehensive exploration but also helps players understand the historical and cultural significance of the site in depth.

To enhance the social aspect, players can share their achievements on social media and interact with other players through the "Explorer's Trail" feature, allowing them to leave virtual notes for subsequent players. This gamification design not only creates an entertaining experience but also educates and inspires visitors to appreciate the cultural heritage of the Warungboto site.

Furthermore, competition among visitors could be an engaging element within the gamification. For instance, visitors could compete for badges or awards based on the number of points they accumulate during their visit. This could foster a sense of healthy competition and encourage visitors to become more actively involved in the offered activities.

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Discussion

The concept of "Rediscover The Lost Garden" developed for the Warungboto site reflects a comprehensive understanding of practices in historical tourism gamification validated through various prior studies. The narrative approach used in the gamification design of Warungboto, particularly through the concept of "Time Explorer," aligns with findings from the CHESS project at the Acropolis Museum in Athens, as discussed by Jefferies (2020). Similar to CHESS, which emphasises the importance of personalising narrative experiences, the Warungboto concept allows visitors to build their personal interpretations of the site through gradual discoveries. This reinforces the premise that personalised tourist experiences can enhance engagement and understanding of cultural heritage values.

The use of augmented reality (AR) technology in the gamification of Warungboto to reconstruct buildings and display historical content shows strong parallels with research by Liu and Nie (2023) in the Ancient City of Nantou. Both implementations successfully integrate spatial and narrative elements to create meaningful immersive experiences. This approach has proven effective in helping visitors visualise and comprehend the historical conditions of the site while establishing an emotional connection with the place.

The reward system implemented in Warungboto, including experience points, virtual badges, and "Historical Fragments," reflects a deep understanding of key elements in museum gamification as identified by Elrouby and El Kasrawy (2019). This system serves not only as an external motivator but also encourages deeper exploration of the historical and cultural content of the site.

The zonation structure in Warungboto's exploration, divided into blue, yellow, orange, and purple zones with progressively increasing difficulty levels, mirrors a similar approach to the "Grand Master Challenge" in Rhodes, as reported by Ahlstén et al. (2023). This tiered approach has proven effective in ensuring mastery, autonomy, and visitor satisfaction throughout the exploration process.

The educational and entertainment aspects integrated into the "challenging, different, insightful" concept at Warungboto align with findings from Widarti et al. (2020) in their study of Indonesian temple complexes. The high level of user acceptance towards approaches that integrate learning with entertainment underscores the effectiveness of this strategy in the context of historical tourism in Indonesia.

Social features such as the "Explorer's Trail," allowing for visitor interaction at Warungboto, reflect an understanding of the importance of collective memory formation as discussed in Liu and Nie's (2023) research. This aspect enriches individual visitor experiences while contributing to the formation of a collective narrative about the site.

While the implementation of gamification at Warungboto has demonstrated good integration with best practices from previous research, there

remains room for further development. Based on recommendations from Tomasevic & Pavicevic (2020), the gamification system could be enriched by considering variations in visit durations and different tourist preferences. Additionally, strengthening evaluation and impact measurement aspects, as well as enhancing integration with digital platforms, could expand the reach and effectiveness of this gamification programme.

Challenges

Based on the research findings, the implementation of gamification at the Warungboto site faces several challenges that need to be addressed in its development. The primary challenge relates to the physical condition of the site, which has not been fully revitalised due to uncertainties regarding the original form of the building. This condition impacts the digital reconstruction process in augmented reality, which must be conducted with great care to ensure historical accuracy and avoid misleading interpretations of the site's original form.

Another challenge arises from the status of the Warungboto site, which is less popular compared to other historical sites in Yogyakarta, such as Taman Sari. This condition necessitates that gamification design not only focuses on entertainment aspects but also effectively builds awareness and appreciation for the historical value of the site. This is evident from the current tendency of visitors to primarily utilise the site for photography rather than exploring its stories and history.

The need for collaboration among various stakeholders in the development and implementation of gamification adds complexity to the project. Effective coordination among the Cultural Heritage Preservation Office, local government, private sector, and local communities is essential to ensure the sustainability and success of this gamification programme. This challenge is further emphasised by the need to maintain heritage values, which necessitates restrictions on physical interventions at the site.

On the other hand, active participation from the local community is crucial, not only to ensure sustainable management but also to enrich the site's narrative through their perspectives and experiences. By integrating local knowledge, folklore, and traditional cultural practices, the Warungboto site can emerge as a unique and distinctive destination that resonates with the spiritual aspects of visitors. Through synergistic collaboration, the Warungboto site can be transformed into a cultural tourism destination that meets visitors' needs for interactive, educational, and meaningful experiences.

Overall, the development of gamification at the Warungboto site demonstrates a comprehensive and evidence-based approach to transforming historical tourism experiences. Alignment with previous research findings provides a solid foundation for the sustainability and long-term success of this programme's implementation. By applying various gamification elements, the Warungboto site can create more engaging and educational experiences for visitors. The use of technology and

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interactive approaches can help visitors gain a deeper understanding of the existing history and culture while enhancing their satisfaction during their visit. Thus, gamification can be an effective strategy to attract more visitors and enhance their experiences at the Warungboto site.

CONCLUSION

The historical site of Warungboto in Yogyakarta can be developed through gamification, offering tourists the opportunity to delve into past narratives in a unique and enjoyable manner. Based on previous research, the concept of gamification in the context of historical tourism has proven capable of enhancing visitor engagement and experiences. Its application at the Warungboto site will enable visitors to understand the values of history, nature, and local philosophy more deeply, while encouraging them to actively participate in preserving the richness of cultural heritage. By integrating game elements, tourists will actively engage in the process of rediscovery, revealing the long-forgotten essence of the Warungboto site and contributing to the crafting of a new narrative about this place.

Based on the research findings, the primary recommendation for the management of the Warungboto site is to establish a collaborative team involving various stakeholders. This team should consist of the Cultural Heritage Preservation Office as the main manager, local government, academics in tourism and information technology, players in the digital creative industry, and representatives from the local community. This multi-stakeholder collaboration is vital to ensure comprehensive and sustainable gamification development, where each party can contribute according to their expertise and roles. With collaborative and integrated management, the Warungboto site can evolve into a model historical tourism destination that successfully blends modern technology with historical and cultural values.

This research is limited to a single case study at the Warungboto site and has not thoroughly discussed the technical aspects of application development; therefore, comparative research and technical studies on implementation can be conducted in the future. Additionally, there has yet to be an in-depth study of the socio-cultural impacts of gamification on the local community, as well as the balance between digital innovation and the preservation of traditional values. These limitations open opportunities for future research to develop a more comprehensive understanding of gamification implementation in the context of historical tourism in Indonesia.

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