

# EMPOWERING HERITAGE TOURISM THROUGH AUGMENTED REALITY: A REVIEW OF DIGITAL TRANSFORMATION FOR ECONOMIC SUSTAINABILITY

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**ABSTRACT:** Heritage tourism is a powerful driver of economic growth in Sri Lanka, largely due to its numerous UNESCO World Heritage sites and archaeological wonders. Hence, the cultural landscape of Sri Lanka offers a unique opportunity to showcase the nation's rich history to a global audience. Augmented reality (AR) emerges as a promising solution for boosting heritage tourism in Sri Lanka by providing an immersive experience for global visitors. While many developed countries have successfully implemented Augmented Reality to boost tourist engagement, its adoption in Sri Lanka remains in the early stages. Hence it is a very complex process to evaluate due to multiple characteristics such as technological, social, environmental, legal, and financial factors. To address these challenges, researchers conducted a systematic literature review using a qualitative approach and performed thematic analysis to identify key factors influencing AR adoption. As a result, the research highlighted the potential of using AR in the Sri Lankan heritage tourism sector by designing a new framework that provides key solutions such as digital infrastructure, cultural sensitivity, environmental conservation, legal guidelines, and fostering collaboration and government incentives. The framework supports the effective incorporation of AR in the Sri Lankan heritage tourism sector, providing a strategy for increasing tourist engagement and preserving cultural heritage. Hence, this will be a large step for Sri Lanka to be a leading destination in heritage tourism and to be built economically through sustainable tourism practices.

*Keywords:* augmented reality, economic sustainability, heritage tourism

## 1. INTRODUCTION

Heritage tourism is an important sector for economic development especially in nations rich in historical and cultural assets like Sri Lanka. With its diverse cultural landscape and numerous UNESCO World Heritage sites, Sri Lanka has the potential to emerge as a leader in this domain (Prabuddha et al., 2024). Augmented reality (AR) is a powerful technology that enhances experience by providing visitors with immersive experience. Numerous countries such as Italy, Greece, Romania, France, Spain, the United Kingdom, and China have successfully integrated AR into their heritage sites resulting in increased tourist engagement, a higher overall tourism revenue and improved educational outreach within the nation (Boboc et al., 2022). However, the main problem of the study is that the AR evaluation of heritage tourism in Sri Lanka is a complex process due to various factors. Wimalasuriya and Kapukotuwa (2020) recommended that future researchers evaluate key factors such as social, technological, environmental, financial, and legal aspects to explore more effective strategies for enhancing cultural heritage sites in Sri Lanka. Currently, AR implementation of the heritage tourism sector in Sri Lanka is in its early stages. As a nation with multiple traditions and numerous archaeological sites, it is essential to integrate digital technology into the Sri Lankan tourism framework (Galmangoda et al., 2022). This study aims to highlight the potential of AR in the heritage tourism sector by designing a new framework with some key solutions. The primary objective of this study is to review existing literature to evaluate the status of AR adoption in heritage tourism focusing on both international and local contexts for a sustainable economy. Further, the study aims to address the importance of leveraging AR not only for enriching tourist experiences but also for ensuring the economic sustainability of Sri Lankan heritage tourism.

## 2. METHODOLOGY

In this study, a qualitative approach was adopted, and existing literature was reviewed to investigate the prospects of AR in enhancing heritage tourism in Sri Lanka. A systematic and scientific analysis was conducted, focusing on literature that relates to AR in tourism

and successful implementations from other countries. Under clear inclusion criteria that cut across the focus areas of the study, including key words such as “augmented reality” and “sustainable economy” and “heritage tourism”, a total of 40 sources were selected from databases like google scholar, Scopus, science direct and IEEE explore. The process of literature review and analysis is illustrated in Fig.1, which outlines the thematic approach, coding, sub-theme emergence, clustering, and framework development steps.

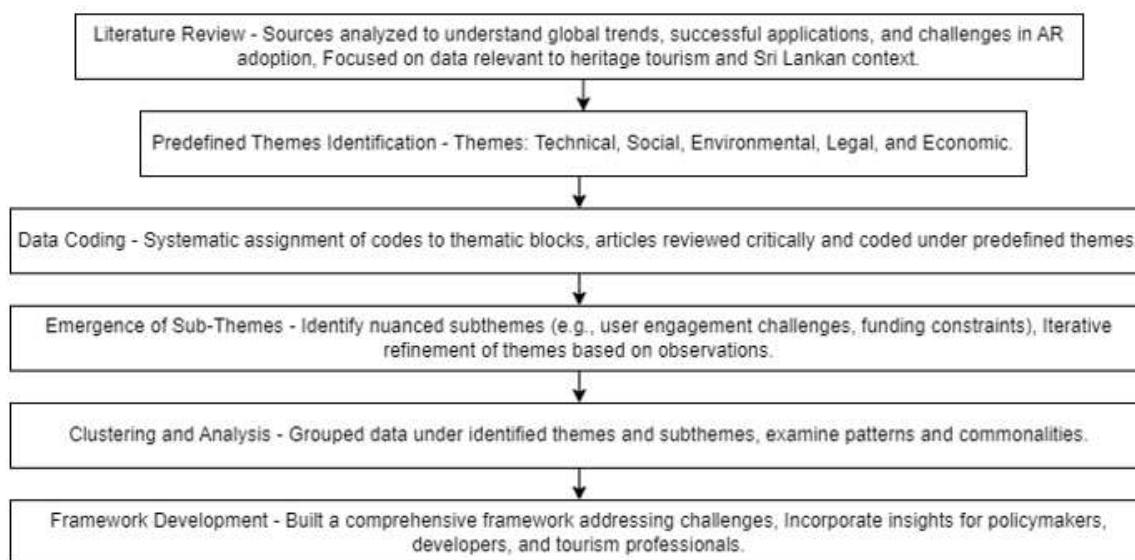


Fig. 1. Research Methodology

### 3. RESULTS AND DISCUSSION

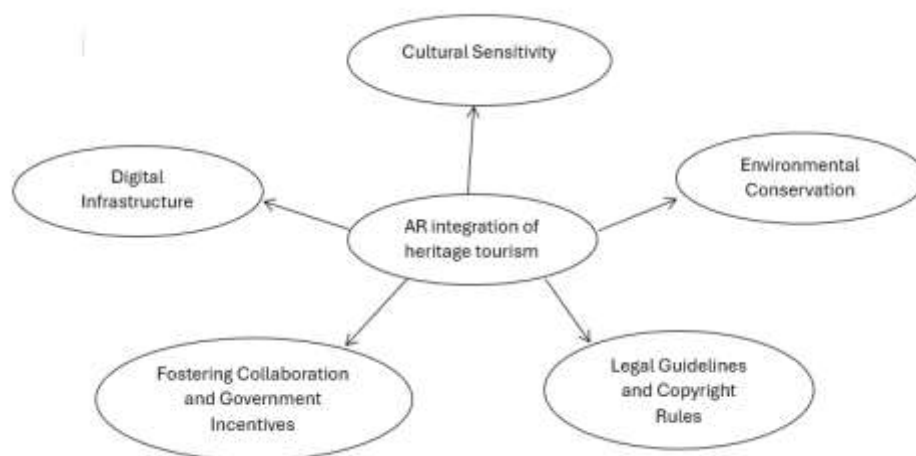
#### 3.1 The Role of AR in Heritage Tourism

AR is a technology that offers an immersive experience for the tourism industry, and it builds a bridge between the past and the present. It allows visitors to engage with historical stories in dynamic ways (Han et al., 2018). By integrating digital information with the physical environment, augmented reality allows the storytelling aspect of different heritage sites (Schaper et al., 2017). Further, it enhances making history accessible enhancing for a wider audience (Han et al., 2018). These technologies can transform static exhibits into dynamic experiences for users to engage with historical and cultural practices in a personal and immediate way (Hoang and Cox, 2017). Wimalasuriya and Kapuwakptuwa (2020) assert that augmented reality is a transformative tool in the context of the rich cultural heritage in Sri Lanka (Wimalasuriya and Kapukotuwa, 2020). Offering interactive storytelling sessions and virtual tours of heritage sites can enhance the educational aspects of tourism while saving the authenticity of cultural aspects (Bhaskara and Sugiarti, 2017). Further, it provides learning opportunities about Sri Lankan heritage with an enjoyable direction. By providing an immersive experience that blends education with entertainment, visitors can gain a deeper understanding as well as more enjoyable memories (Jung et al., 2014). This will be more helpful to get an idea about the significance behind each tradition and craft.

#### 3.2 Adopting AR into Heritage Tourism

According to Wimalasuriya and Kapukotuwa (2020), integrating digital techniques into heritage sites is a very complex and long-term process in Sri Lanka. Technological, social, environmental, financial, and legal challenges need to be evaluated when planning the implementation, operation, and sustainability stages of the project life cycle. Hence, the study proposes a comprehensive

framework for the adoption of AR in Sri Lankan heritage tourism to overcome the challenges of a sustainable economy.



**Fig. 2.** Framework for AR integration of Sri Lankan heritage tourism

Technological infrastructure development is a foundational step in successful AR integration in the heritage tourism sector. Italy upgraded digital infrastructure on their major historical sites such as the Colosseum in Rome while ensuring high-speed internet access and stable mobile connectivity (Brunet et al., 2022). France has introduced user-friendly AR applications in popular heritage sites like “ABBEY OF EPAU” (Simonetto et al., 2013). Further, South Korea invested in technical training sessions for tourism professionals and site managers to ensure proficiency in maintaining and managing AR systems. Training programs help guide AR experiences and to troubleshoot the issues continuously (Koo et al., 2019). Technological infrastructure development in Sri Lanka should be prioritized due to lack of necessary digital infrastructure to enhance immersive AR experiences. The study suggests upgrading internet connectivity at heritage sites ensuring reliable high-speed network. Similarly, developing user-friendly smartphone applications would be an added advantage to enable visitors to access AR experiences without the need for special equipment.

The countries that successfully integrated augmented reality into cultural heritage tourism have prioritized social engagement and awareness to increase their cultural sensitivity (Cranmer, 2017). Nations like Spain and Italy have actively engaged with public awareness campaigns to promote the benefits of AR (Graziano and Privitera, 2020). Community involvement is a critical factor in AR projects to ensure cultural authenticity (Boboc et al., 2019). Local historians and cultural experts in Greece have collaborated on AR reconstructions at “Acropolis” (Karagianni, 2023; Stamati et al., 2022). Also, artisans and historians in India have been involved in developing AR contents that show the richness of local traditions (Vashisht and Sharma, 2024). These facts ensure AR technology preserves cultural heritage as well as resonates with local communities. France has invested in capacity building and training cultural and tourism professionals to implement and manage AR effectively (Danny Hana et al., 2018) Sri. Lanka needs to emphasize the significance of community involvement in creating AR applications that are both culturally and locally relevant. During the development process, historians, cultural experts and artisans should ensure AR experiences accurately reflect Sri Lankan tradition and historical narratives. Hence, the study proposes to launch public awareness campaigns to promote the benefits of heritage tourism not only for global visitors but also for the local community.

AR is a powerful technology to offer virtual access to sensitive and restricted areas because it reduces the physical impact of tourism. For example, “Manchu Picchu” in Peru, AR allows visitors to explore

areas virtually thus protecting the site from damage (Mann, 2018). Similarly, Iceland offers rich immersive experiences providing virtual tours while limiting foot traffic on sites (Guðjónsdóttir et al., 2022). Nations like Egypt have reduced the need for physical infrastructure through AR (elnoby osman et al., 2024). The Pyrami Giza provides an immersive experience for the visitors introducing natural environments (Orabi et al., 2022). In Sri Lanka, the study proposes AR as a tool while providing virtual access as a sustainable tourism practice reducing the physical footprint in sensitive areas. Also, highlights the significance of having AR to reduce the need for physical infrastructure to preserve the natural environment.

Countries that have successfully integrated augmented reality heritage tourism have recognized the need for a legal and ethical framework to protect both cultural heritage and technology (Yung and Khoo-Lattimore, 2017). Italy has developed legal guidelines to ensure AR reconstructions. Spain has established strict copyright laws to protect AR content related to cultural landmarks (Graziano and Privitera, 2020). Data privacy laws are also a crucial component. Most countries follow strict data protection standards, and they have implemented strong rules and regulations to ensure AR applications (Han et al., 2013). Sri Lanka needs intellectual property protection to safeguard the rights of content creators for projects involving historical elements or culturally sensitive. This may cause to protection of personal information to maintain AR platforms with high levels of trust and security.

According to the findings countries that have successfully integrated AR into heritage tourism have prioritized financial sustainability and investments through different aspects. Fostering private-public partnerships government bodies, technological companies, and cultural organizations collaborate to fund AR-related projects. In Italy, the collaboration between the private and public sectors has enabled the development of AR projects providing cutting-edge technology while preserving cultural heritage (Dubini et al., 2012). Government incentives also play a significant role in supporting AR adoption. A country like Singapore offers tax breaks for both tourism operators and technical developers who invest in AR technology for heritage sites (Ooi, 2006). The financial support encourages more stakeholders to be involved with AR-driven projects (Serravalle et al., 2019). Financial sustainability is the most important factor for Sri Lanka should be considered a developing country. Hence, the study advocates for private partnerships between government agencies, cultural institutions, and private tech companies to co-invest in AR projects. It is essential to provide financial incentives like tax breaks and grants to the Sri Lankan government to encourage tourism operators and AR developers to invest in this technology. The proposed framework identifies key aspects necessary for successful integration of augmented reality (AR) into heritage tourism in Sri Lanka. These include digital infrastructure, cultural sensitivity, environmental conservation, fostering collaboration and government incentives, and establishing legal guidelines and copyright rules. The visual representation of this framework is illustrated in Fig. 2.

#### **4. CONCLUSION**

Focusing on key features such as technical, social, environmental, legal, and financial is essential for the success of AR integration in Sri Lankan heritage tourism. The study highlights the potential of AR in the heritage tourism sector while designing a new framework with key solutions like digital infrastructure, cultural sensitivity, environmental conservation, legal guidelines and copyright laws, and collaboration and government incentives. Hence, the study concludes the research output in terms of findings as follows.

Improving network facilities, developing user-friendly smartphone applications, and effective management and maintenance are key solutions to overcome technical challenges. Launching public awareness campaigns to promote AR and creating culturally and locally relevant AR applications is

a successful strategy to overcome cultural sensitivity. Reducing physical infrastructure and physical footprint in sensitive areas is the best solution to overcome environmental conservation and the best possible solution to legal problems is to introduce intellectual property protection to safeguard the rights. Financial incentives, private and public partnerships, and the introduction of revenue models are the best outcomes that researchers have explored to overcome financial constraints.

The study faced few limitations since Sri Lanka remains in the early stages of AR adoption. Hence, the research is focused only on secondary data from articles related to international contexts due to the limited availability of local insights. The lack of AR projects in Sri Lankan heritage tourism is also another barrier to assessing the practical feasibility of AR adoption in the heritage sector. For future developments, the study suggests several directions for further research, including collecting primary data from local stakeholders, piloting AR projects at heritage sites, and assessing the direct impact of AR on visitor experience.

## 5. REFERENCES

- Galmangoda, G. D. D. M., Gajanayake, P. Y. S., Indika, K. P., Rajapaksha, N. R., & Jayaweera, Y. (2022). Augmented reality in cultural heritage: An overview of the last decade of applications. *Applied Sciences*, 12(19), Article 9859. <https://doi.org/10.3390/app12199859>
- Han, D., Weber, J., Bastiaansen, M., Mitas, O., & Lub, X. (2018). Virtual and augmented reality technologies to enhance the visitor experience in cultural tourism. In M. Claudia tom Dieck & T. Jung (Eds.), *The power of augmented and virtual reality for business* (pp. xx-xx). Springer. [https://pure.buas.nl/ws/files/429167/Han\\_Weber\\_Bastiaansen\\_Mitas\\_Lub\\_Virtual\\_and\\_augmented\\_reality\\_technologies.pdf](https://pure.buas.nl/ws/files/429167/Han_Weber_Bastiaansen_Mitas_Lub_Virtual_and_augmented_reality_technologies.pdf)
- Prabuddha, C., Ranasinghe, J. P. R. C., Wasantha, H. L. N., & Dangalla, D. K. T. (2024). The augmented reality effect on destination satisfaction towards revolutionizing heritage tourism in Sri Lanka. *Sri Lanka Journal of Marketing*, 9(3), 179–208. <https://doi.org/10.4038/sljmuok.v9i3.1>
- Wimalasuriya, R., & Kapukotuwa, A. (2020). Augmented reality-enabled mobile apps for enhancing value-based interpretation at cultural world heritage sites of Sri Lanka. *Journal of Archaeology, Tourism & Anthropology*. [https://www.researchgate.net/publication/366439851\\_Augmented\\_Reality-enabled\\_Mobile\\_Apps\\_for\\_Enhancing\\_Value](https://www.researchgate.net/publication/366439851_Augmented_Reality-enabled_Mobile_Apps_for_Enhancing_Value)