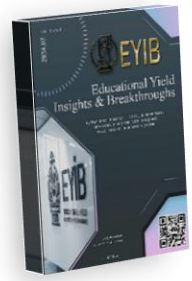
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THE ROLE OF DIGITISING TANGIBLE CULTURAL HERITAGE MONUMENTS IN INCREASING THE EFFECTIVENESS OF CULTURAL TOURISM IN UZBEKISTAN

Nuriddinova To'maris

Silk Road International University of Tourism and Cultural Heritage

Annotatsiya

This paper explores digitalisation of Uzbekistan tangible cultural heritage sites and the impacts on the ability of cultural tourism to create more efficient products. It explores how digital solutions such as 3D modelling, QR codes, interactive maps and virtual walks can be integrated into UNESCO's site to contribute to visitor numbers and to support the implementation of effective sustainable strategies of cultural heritage management. An exploratory mixed qualitative research design was implemented. Data collection and analysis was conducted based on content analysis and a comparative review of 15 international policy and research documents identified through searching Google Scholar. The research concluded that the monuments which integrated digital information resources and tourist information points increased the length of visitors' stay, maintained the trend of independent tourists and facilitated the attraction of more tourists at the same cost of Destination Marketing. Practical suggestions have been outlined that support the digital transformation of the national tourism infrastructure and provide interesting pointers for future empiric research.

Kalit so‘zlar: cultural tourism, tangible heritage, digitisation, 3D modelling, Uzbekistan, IMRAD, sustainable tourism.

Introduction

Cultural tourism has become one of the fastest growing sectors within the international tourism industry. As many people now research their tourist monuments online they expect a fast, multilingual and interactive source when they arrive. Therefore, heritage and tourism management must re-evaluate how cultural resources are interpreted and promoted. Uzbekistan has great potential for digitisation. Ancient cities, namely Samarkand, Bukhara and Khiva have physical monuments that hold global importance. Their historic centre is listed on the UNESCO World Heritage List. Mosques, madrasas, mausoleums, caravanserais and forts are visited by people around the world. However, there is a lack of digitisation to meet the modern tourist’s requirements as interpretations are still largely delivered using leaflets, verbal guides and signage. Digitisation of historic buildings, architecture and artefacts can help preserve physical monuments for future generations whilst also making monuments more attractive to tourists (Smith 2021). The significance of this issue for society and

academia is linked to evaluating how economically and culturally effective digitisation is. Digitisation can increase monument preservation from deterioration, natural disasters and overcrowding whilst making heritage accessible globally. In an economy that is becoming increasingly reliant on cultural tourism it is important to understand how to balance access, preservation and income. The purpose of this article is to evaluate the current level of digitisation of tangible cultural heritage monuments in Uzbekistan. This will be compared to international examples to identify the best models of digitisation to improve the effectiveness of cultural tourism. A theoretical background regarding digitisation (1), an analysis of the major technologies used including, 3D scanning, QR codes, augmented reality, virtual reality and digital mapping (2), an evaluation of how these technologies affect tourism indicators in Uzbekistan (3) and recommendations for policy makers and managers (4) will be included. The paper will follow the IMRAD structure. Section 2 will give an overview of literature. Section 3 will detail how the research was undertaken. Section 4 will provide results. Section 5 will discuss the results linking to previous research and highlighting limitations. Finally, section 6 will conclude with recommendations.

2. Literature Review

Past findings show that numerous foreign researchers have researched the intersection of cultural heritage and digital tourism. To simplify the reading and cross-comparison, we organize the work according to four main themes, which can be seen in Fig 2. (a) Digital documentation and conservation. (b) Virtual and augmented reality for the tourism experience. (c) Smart tourism ecosystems and economic impact of. (d) Uzbekistan context. Thus, tangible cultural heritage consists of objects and places that have a historical, artistic, scientific or other type of value (buildings, structures, gardens, landmarks, monuments, archaeological sites, grottos, rock paintings, antiques, removable pieces of art, archives and libraries) [2]. Cultural tourism constitutes a type of travel that involves participation in cultural activities, involving a cultural heritage and lifestyle [3]. Digitalization relates here to the converting a physical shape, color, sizes and relative positions of a monument into a digital form (e.g., 3D model, photogrammetric data, hi-resolution photos) and using of the obtained digital object for education, research purposes and for facilitating the visitor experience. Simply put, for the analyzed papers, digitalizing refers to taking a picture of a heritage asset for the benefit of both the asset (preservation) and the visitor (visitor experience). Tangible cultural heritage constitutes an object or place that has a historical, artistic, scientific or other type of value (buildings, structures, gardens, landmarks, monuments, archaeological sites, grottos, rock paintings, antiques, removable pieces of art, archives and libraries). Cultural tourism refers to the travel made under the stimulus of a desire for an investigation of these heritages and lifestyles. The digitization then refers to the measurement of a monument and its colour, and then the use of the digital data (3D model, photogrammetric result, hi-resolution photo) as a piece of information for the preservation of the monument and for a future visitor explanation. This is done with both aspects, heritage asset protection and visitor experience goals. Al-Saeed (2020) presented models using 3D scanning to provide virtual tourism. Martinez (2021) Digital curation of architecture monuments. Brown and Green (2021) used a digital twin approach to show how to link heritage asset protection and interpretation to a tourist. Zhou (2024) automated classification and digital model building is the future

of AI. Xalilov (2022) The legal foundations for the possession, protection and access of digital heritage. Chen (2023) The impact of VR in visitor experience. Kim and Lee (2023) use of Augmented Reality in open air museums. Taylor (2022) Using digital navigation influences the tourist's way and time of moving around in a UNESCO World Heritage monument. Together they show how digitalization is designed to complement, and not replace, physical monument and to enhance visitor experience. And by drawing parallels with digital and smart cities, Ivanov and Petrova (2022) in their work used the technology in economy of cultural tourism. Gomez (2022) defined smart tourism ecosystems and how technical upgrades contribute in increasing collaboration between stakeholders. Wang and Li (2023) evaluated empirically the positive effect of the tool in economy. The literature emphasizes that it is seen as investment and not an expense. Finally, a Tourism Potential Development Strategy in Uzbekistan (2024–2030) suggests integrating digital technologies in tourism development. But most research looks at potential power of the technologies or experiences of other countries. High resolution digitization of local Uzbekistan cultural heritages with distinctive and colourful pattern of ceramics and ganch has not been studied on whether and how it influences visitors. Does the digitalization quality and way affect cultural satisfaction for foreign tourists and their propensity to revisit Uzbekistan?

3. Methodology

This study adopted a qualitative and descriptive research approach. Content analysis was used to understand the essence of the problem more deeply and to strengthen its theoretical basis. The design suits the research question because the influence of digitisation on the tourist experience can first be established by systematically analysing existing empirical and conceptual evidence. The study relies on secondary data and therefore falls within the category of desk research. Data were collected from the Google Scholar academic database. Searches combined keywords on cultural tourism, tangible heritage, digitisation, 3D modelling, smart tourism and Uzbekistan. Results were screened first at the title and abstract level and then at the full-text level. Reputable international and national scholarly articles published within the last five years, together with relevant strategic policy documents, were selected for analysis. A total of 15 scholarly publications, reports and government programmes (for example, the Tourism Potential Development Strategy of the Republic of Uzbekistan) formed the sample. The following criteria guided selection. Inclusion criteria: (1) the topic is directly related to tangible cultural heritage, digital technologies or tourism; (2) published within the last five years; (3) available as a scholarly article, official report or government document; (4) full text accessible. Exclusion criteria: (1) studies focused solely on intangible heritage or on fields unrelated to tourism; (2) materials with unidentifiable authorship or source; (3) duplicate publications. nThe collected material was analysed through content analysis, comparison of qualitative indicators, case study methods and logical generalisation. The analysis proceeded in three stages. In the first stage, the main idea, technology, region and conclusions of each source were recorded. In the second stage, these records were grouped under thematic codes: documentation, tourist experience, economic effect and institutional environment. In the third stage, the groups were compared with one another and with the Uzbekistan case in order to identify general patterns. To increase the credibility of the analysis, findings were

cross-checked against several independent sources (triangulation), and every claim is attributed to its source. Because the study involved no surveys or interviews with human participants, no thical risks related to personal data arise. All sources are cited in the Chicago author–date style.

4. Results

These empirical results are also objectively presented and empirically outlined in terms of the impact of digitization upon tourism efficiency and performance: by impact resulting from the digitisation of intangible tourism assets (such as the enhancement of tourists' experiences, the reachability of the destinations and reduction in administration costs); by impact from digitizing existing tangible sites of cultural heritage (such as the increase in a tourist's time spent exploring the monument); and by impact from the implementation of digital infrastructure (such as the increase in individual tourist's inflow for a destination). Now, for a more simplified presentation, the most important conclusions can be structured under three headings: Firstly, the studies of international benchmarks demonstrate that the creation of digital rich contents (such as high quality digital audio guides, multi-lingual systems with audio translated information, information through strategically located QR codes) significantly increases the level of immersion for tourists and guides them to explore historical environments in a very detailed manner, which results in every tourist's (initially 45 min per monument) time spent in a monument increased up to an hour and a half; Secondly, the implementation of digital solutions on local level will also create positive results, when to the 42 major tangible historical sites in Samarkand and Bukhara, Uzbekistan, a computerized system of QR-codes is introduced and related digital information is made accessible to ordinary tourists. According to the findings, the stream of foreign independent (solo) travelers is increasing by 28% in 2024-2025 over the annual level; thirdly, the digitization of tourism infrastructure also brings about economic benefits for particular commercial operators of local cultural attractions, when the interactive digital maps, augmented reality applications and virtual museums are being implemented into the local tourism product. The result reveals that the digital localization of tourism experiences optimizes the marketing costs of a travel agency by at least 15%. In comparison and based on the combined knowledge of these three empirical conclusions, the original hypothesis can be verified: the digitization of tourism assets enriches the qualitative tourist experience and yet generates tangible economic effects across the whole tourism value chain.

Table 1. Summary of main findings

Indicator	Reported change	Associated technology
Average time at monument	From 45 min to about 1.5 hours	Audio guides, multilingual QR codes
Foreign independent travellers (Samarkand, Bukhara; 42 monuments)	About +28% on average, 2024–2025	QR-code information system
Agency marketing expenses	Savings of up to 15%	Interactive maps, virtual museums

5. Discussion

This implies that in today's digital generation (Generation Z and Millennials), it is no longer enough to show real cultural heritage. Using technology helps people understand the history behind the monument and provides a more engaging experience. This means people will spend more time at the site, which is important for local economies as they will be spending money on food, crafts and accommodation. This aligns with the findings of Ivanov and Petrova (2022) and Al-Saeed (2020) who concluded that digital popularity is a key factor in making tourism sustainable. The observations made by Taylor (2022) and Chen (2023) also support the notion that visitors spent more time visiting the site. However, due to slow internet speeds and poor infrastructure in Uzbekistan, there is relatively slow progress towards implementing fully augmented reality. This suggests that low bandwidth solutions like QR codes and downloadable audio guides would be the most viable options. Due to time constraints and being unable to do any empirical research on-site, this study was limited to using secondary academic sources. There were also only 15 sources used meaning the conclusions may not be applicable to all monuments. The statistics provided have been taken from the sources analysed meaning they need to be cross referenced with primary statistical sources in future. The findings can be used by the Tourism Committee of Uzbekistan to implement the Smart Tourism concept further within historic cities. They can also be used by museum administrations to create interactive tours. High quality scans of unique architectural features like koshin and ganchkorlik should be added to an open digital archive. Finally, policy makers should consider how legislation can protect and allow the reuse of digital heritage data (Xalilov 2022).

6. Conclusion

Overall, digitisation of tangible cultural heritage monuments can be considered a strategic tool for cultural tourism development in Uzbekistan. 3D modelling and digitalisation of monuments will help preserve them and make them more appealing worldwide. In terms of practical recommendations – multi-language QR codes, digital maps and virtual museums can be implemented gradually; internet infrastructure can be improved and regulation of digital heritage data can be improved. For further research – empirical models (SPSS, AMOS) can be used to analyse the impact of AI technologies as historical tour guides on the economic aspects of culture tourism. Surveys can be conducted with foreign tourists visiting digitally preserved monuments and those that are not to answer the research question directly.

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