

Digitization of Cultural and Historical Heritage and Sustainable Development of Cultural Tourism on the Bulgarian Black Sea Coast

Evgeniya Nikolova^{1, 2}[0000-0001-8313-1572], Vilyana Ruseva²[0000-0002-7200-2756]

¹ Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, Bulgaria,
1113 Sofia, Acad. Georgi Bonchev Str., Block 8

² Burgas Free University, Bulgaria, 8001 Burgas, 62 San Stefano Street
evgeniyanikolova@gmail.com, vruseva@bfu.bg

Abstract. The aim of the research is to assess the impact of digitization of cultural and historical heritage on cultural tourism along the Bulgarian Black Sea Coast. The methods include an analysis of tourism websites and surveys with tour guides and representatives of tourism organizations. The results show that the lack of VR, AR, and virtual tours limits the attractiveness of the websites. Investment in technology and training is needed to improve accessibility and competitiveness of the region as a cultural tourism destination.

Keywords: Digitalisation of Cultural Heritage, Cultural Tourism.

1 Introduction

The digitization of cultural and historical heritage has significantly impacted cultural tourism, increasing the global visibility and promotion of landmarks through digital platforms, 3D models, virtual tours, and online archives. Technologies like virtual tours, digital maps, and multilingual resources overcome geographical and demographic barriers, offering cultural interpretations to audiences unable to visit in person.

Innovations such as virtual reality (VR) and augmented reality (AR), along with historical reconstructions, enhance visitor experiences, providing immersive encounters that strengthen the emotional connection to cultural sites. Digital guides, multimedia resources, and interactive tools also contribute to intellectual enrichment and cultural awareness, offering visitors a deeper understanding of historical, cultural, and social significance.

In terms of sustainable resource management, digitizing fragile artifacts and creating virtual alternatives help reduce the physical strain on cultural sites while generating new revenue streams through online ticketing and digital products. These funds can then be reinvested into preservation efforts.

Cultural tourism also brings in substantial revenue from ticket sales, souvenirs, services, and events, which supports the ongoing digitization of cultural assets. The demand for innovative experiences, such as virtual and AR/VR tours, drives the development of new technologies to further digitize and enhance cultural sites. Feedback from tourists through surveys, social media, and reviews helps prioritize which sites and themes to digitize, ensuring alignment with visitor interests and preservation goals.

Tourism campaigns that integrate cultural heritage elements encourage the creation of targeted digital content for global promotion, improving accessibility and visibility. Growing interest in lesser-known cultural sites and traditions also promotes the digitization of these elements, ensuring their preservation and worldwide recognition for future generations.

The paper's framework is comprised of the subsequent sections: The literature review is briefly described in Section 3, the methodology and study's scope are presented in Section 2, the analysis of the results is addressed in Section 4, and the conclusion is provided in Section 5.

2 Methodology and Scope of the Study

The theoretical framework of the study is based on the integration of several key theories and concepts that explain the impact of digitalization on cultural tourism. The Technology Acceptance Model provides a foundation for analysing the factors that determine how tourists and guides accept and use digital platforms. The consumer behaviour model in tourism highlights the importance of access to information and convenience when selecting a destination. The concept of sustainable tourism emphasizes the role of digitalization in extending the tourism season and preserving cultural and historical sites. Digitalization is viewed as a tool for enhancing the tourist experience through personalized and interactive technologies, such as virtual and 3D tours. The theoretical framework also incorporates marketing aspects, such as the influence of digital technologies on tourists' decision-making processes. The combination of these theories allows for an analysis of the impact of digitalization on cultural heritage and its role in the development of cultural tourism, focusing on aspects such as attractiveness to tourists, the possibility of virtual experiences, and the enhancement of physical visits. The study aims to answer several key questions:

- Which cultural and historical sites on the Black Sea coast have been digitized?
- How does digitalization improve access to and experiences for tourists?
- What is the economic effect of digitalization on local tourism?

The research adopts a mixed-methods approach, combining both quantitative and qualitative techniques to provide a comprehensive understanding of the role of digitalization in the development of cultural tourism along the Bulgarian Black Sea coast. The study is carried out in three phases. In the first phase, a literature review of scientific articles and reports on the role of digitalization of cultural heritage in the development of cultural tourism is conducted. The review demonstrates how technologies are transforming tourism and increasing interest in cultural and historical sites. In the second

phase, a focus group of experts evaluates the functionality, design, and content of museum websites and tourist portals. Each website is rated on a 10-point scale based on criteria such as ease of navigation, content dynamism, visual appeal, multimedia integration, language accessibility, mobile compatibility, loading speed, SEO optimization, and connection with social media. In the third phase, a survey is conducted among guides and representatives from the tourism industry using two anonymous online questionnaires distributed through the Southeastern Union of Tour Guides and Burgas Regional Tourist Chamber. Each questionnaire contains 15 closed-ended questions aimed at identifying the main benefits and challenges associated with the digitalization of cultural heritage to increase cultural tourism. The sample size for the first group of respondents is 24, and for the second group 59. The data collection took place in December 2024 and January 2025.

Quantitative data from evaluations and surveys will be analysed using statistical methods to identify key success factors and areas for improvement in digital engagement.

3 Brief Literature Review

The integration of digital technology in cultural heritage has significantly transformed visitor experiences at historic sites. Institutions aim to enhance public understanding and support for heritage conservation through interpretive infrastructure and improved accessibility, enriching engagement with cultural sites (ICOMOS, 2002). Since the 1990s, technologies like virtual reality (VR), augmented reality (AR), and mixed reality (MR) have revolutionized heritage presentation by offering interactive and immersive elements. These technologies provide multimedia, 3D animations, and gamification, creating a dynamic experience that transcends static text and images (Liu, 2020).

The historical use of digital technology in heritage dates to 1952 with the Stedelijk Museum's voice-guided navigation, providing historical context and exhibit information. UNESCO has long emphasized the importance of communication and audio-visual technologies in heritage interpretation (UNESCO, 1972). Today, VR and AR enable heritage sites to offer varied and interactive experiences, enriching visitors' understanding of history (Vaz et al., 2018). However, these technologies should not only distribute information but also foster deeper visitor interactions with exhibits (Othman et al., 2011).

Case studies like Wang et al.'s (2006) immersive AR for Yuanming Garden and Gleue and Dähne's (2001) mobile app for Olympia highlight the potential of digital displays, though they often prioritize technical design over visitor impact. This underlines the need for thorough evaluation of digital tools in cultural heritage. Future research should focus on assessing how these technologies enhance visitor experiences and ensure their effective integration into heritage interpretation.

The use of VR and AR has transformed historical tourism, allowing immersive experiences that transcend time and space. Virtual reality allows travellers to digitally experience historic places, enhanced with contextual information, audio tours, and narratives, therefore cultivating a profound relationship with history (Dawson et al., 2018).

For instance, the Porta Nocera necropolis at Pompeii was digitally reconstructed using VR, offering a 360° experience while supporting preservation (Malfitana et al., 2018). Similarly, AR enriches monuments by overlaying historical images and interactive guides, increasing visitor engagement (Damala & Stojanovic, 2012). The Hwaseong Fortress AR app provides navigation and educational content, enhancing the tourist experience (Koo et al., 2019).

Interactive multimedia exhibitions also foster engagement, combining traditional displays with digital elements. The Chicago Museum of Science and Industry exemplifies this, with exhibits like "Science Storms" and "Pompeii: The Exhibition" that offer real-time interactions and holographic projections (MSI, 2023a; MSI, 2023b). These examples demonstrate how VR, AR, and multimedia technologies improve the accessibility, engagement, and educational value of cultural heritage, aiding both preservation and global recognition.

4 Assessment of the Digitalization of Museums and Tourist Portals Along the Bulgarian Black Sea Coast

The digital transformation of cultural and historical heritage plays a crucial role in enhancing the cultural tourism sector, particularly along the Bulgarian Black Sea Coast. In this context, the evaluation of museum websites and tourism portals becomes essential for understanding how digital resources can attract visitors and improve user engagement. By evaluating key aspects such as website functionality, interactivity, and multilingual support, the study identifies areas for improvement that could strengthen the region's digital presence. Additionally, the findings from surveys conducted with tour guides and tourism companies provide valuable insights into the impact of digital technologies on tourism experiences and highlight the potential for further innovations.

4.1 Results from the Evaluation of the Websites of Museums on the Bulgarian Black Sea Coast: Functionality, Accessibility and Interactivity

The evaluation of the websites of museums along the Bulgarian Black Sea coast (including institutions such as the Historical Museums of Kavarna, Balchik, Varna, and others) aims to assess their effectiveness in attracting tourists through the integration of contemporary digital technologies. It also seeks to identify barriers faced by diverse user groups, including individuals with disabilities, foreign visitors, and younger audiences expecting interactivity and innovation. This evaluation serves as a strategic tool for resource allocation, targeting digitization efforts to enhance visitor attendance and promote cultural heritage. Key aspects, such as content quality, website functionality, innovation, and user-friendliness, were analysed to form evaluation criteria focused on user experience, accessibility, and audience engagement.

The analysis pays particular attention to the use of social media and event promotion, highlighting the importance of interaction with visitors and the effective presentation

of cultural heritage. Websites were evaluated on a ten-point scale, with ratings reflecting their ability to meet the criteria. The results show that websites generally offer easy navigation, with the museums in Byala, Nessebar, and Sozopol excelling in this regard by minimizing clicks and time for users to access key information. However, accessibility for people with disabilities is lacking, as most sites do not provide specialized tools, except for the Byala museum. Additionally, language limitations (mainly Bulgarian and English) restrict accessibility for international audiences.

Visual content on the websites is limited, with the Regional Historical Museum in Burgas being an exception, offering high-quality digital content for its "Aquae Calidae" collection. Most museums lack 3D models or virtual tours, an omission that undermines the appeal of these sites in the context of modern digital expectations. Only a few websites, including those in Balchik, Byala, and Varna, provide such features. Social media activity is generally low across the evaluated museums, with some institutions, such as the Nessebar and Kavarna museums, not utilizing social media sharing features at all. This limits their potential to reach broader audiences and increase engagement.

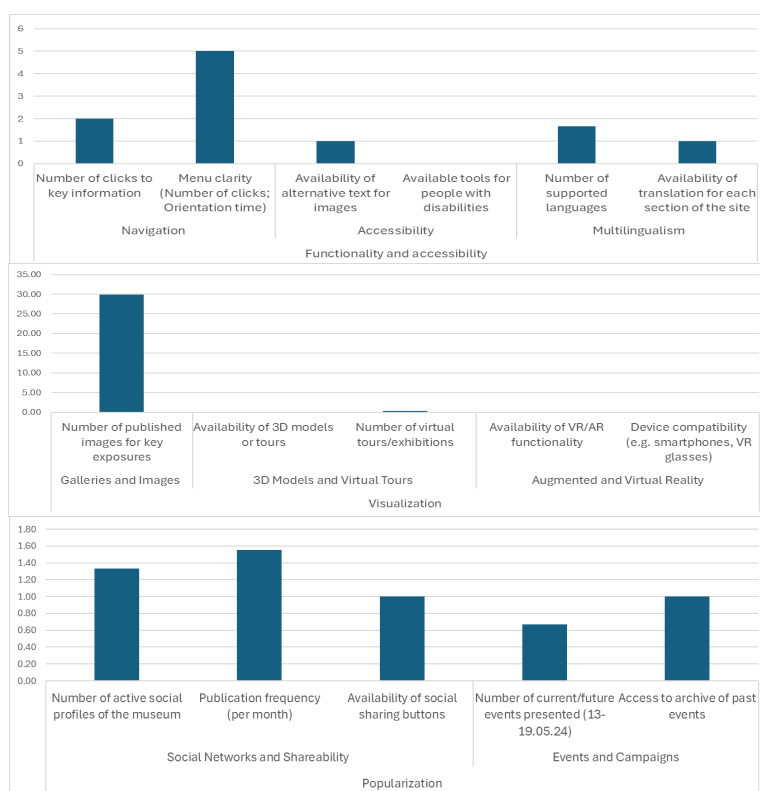


Fig. 1. Measures of central tendency.

Figure 1 presents the measures of central tendency for various indicators related to the functionality, accessibility, and popularization of museum websites. The data highlights key aspects such as navigation ease, multilingual support, virtual experiences, and social media engagement, offering a quantitative overview of the current performance of the portals based on factors like the number of clicks, to key information, availability of 3D models, the frequency for events publications.

There is a significant potential for improvement in many aspects of the museum websites along the Bulgarian Black Sea coast, especially in areas such as visualization, interactivity, multilingualism, and promotion through social media and events. Although the websites demonstrate good practices in accessibility, they still do not fully utilize the potential of technologies and social media to attract a wider audience and better showcase the region's cultural and historical heritage.

4.2 Results of the Evaluation of Tourism Portals on the Bulgarian Black Sea Coast

The assessment of tourist portals along the Bulgarian Black Sea coast evaluates their effectiveness in promoting cultural heritage and enhancing user experience. It examines content quality, multimedia integration, language accessibility, mobile compatibility, and more. The results provide insights into the strengths and weaknesses of the portals, guiding improvements for better user engagement and support for cultural tourism. The portals of Varna and Sozopol scored 7 on Content, indicating satisfactory presentation, while portals of Burgas and Nessebar received 8 for more detailed information. In terms of Informativeness, portal of Nessebar excelled, providing extensive information on tourist activities, history, and services. The evaluation reveals that, portals of Nessebar and Sozopol were rated highest (9) for their presentation of the historical landmarks. Seasonal and event promotion was strong for these portals, while marketing efforts were notably better in portal of Burgas (7). The "Content and Resources" criterion showed strong performance, but the "Interactivity" aspect remains a weak point, with scores ranging from 3 to 5, signaling a need for innovative features such as virtual tours and interactive maps. Multimedia content was generally limited, with low scores on the Multimedia indicator (5-6), suggesting a lack of engaging elements such as videos and interactive features.

Regarding language accessibility, most sites offer Bulgarian and English options. The portals scored highly for mobile compatibility, particularly portals of Burgas and Nessebar, which had strong optimization for mobile devices. While they all performed efficiently in terms of load time, they scored poorly (3-4) on the Virtual Tours metric, indicating minimal or no virtual experiences. Additionally, most lacked effective booking services, and feedback mechanisms were scarce. Despite these limitations, the sites effectively reflect the region's cultural events and history, with portal of Nessebar earning the highest score for Regional Specificity (10). Although content is regularly updated, it does not sufficiently account for seasonal tourism dynamics.

SEO optimization scores were positive, suggesting good search engine visibility, though the portals lacked robust promotional efforts. Their social media presence was minimal, and engagement was low.

Table 1 presents the evaluation of special websites for Black Sea tourism, where the official tourist portals of Varna, Burgas, Nessebar, and Sozopol received average scores ranging from 6.61 to 7.13, reflecting varying levels of performance across different criteria. Table 2 focuses on the evaluation of these websites from the perspective of cultural tourism, with scores ranging from 6.4 to 7.2, highlighting the strengths and weaknesses of each portal in promoting cultural heritage and tourism.

Table 1. Evaluation of websites for Black Sea tourism.

Websites	Official tourist portal of Varna https://visit.varna.bg/	Official tourist portal of Burgas https://www.gotoburgas.com/	Tourist portal of Nessebar Municipality https://visitnessebar.org/	Tourist portal - Sozopol https://sozopol.bg/bg/turisticheski-portal.html
Average score	6.91	7.13	7.13	6.61

Table 2. Evaluation of websites for Black Sea tourism from the perspective of cultural tourism.

Websites	Official tourist portal of Varna https://visit.varna.bg/	Official tourist portal of Burgas https://www.gotoburgas.com/	Tourist portal of Nessebar Municipality https://visitnessebar.org/	Tourist portal - Sozopol https://sozopol.bg/bg/turisticheski-portal.html
Average score	6.8	7	7.2	6.4

4.3 Survey Results

This study is part of a study on the interaction between the digitalization of cultural and historical heritage and cultural tourism, specifically focused on the Bulgarian Black Sea Coast. This section presents the results of two surveys conducted among tour guides and representatives of tourism companies operating on the Bulgarian Black Sea Coast. The findings from these surveys offer valuable insights into how digital technologies are currently impacting cultural tourism and reveal the potential for further digital innovations in the region's tourism infrastructure.

The survey conducted among tour guides working on the Bulgarian Black Sea Coast provides valuable data on the impact of the digitization of cultural and historical heritage on the development of cultural tourism in the region. The results indicate a high level of awareness among the respondents regarding the availability of digital resources, with 69.6% confirming their knowledge of virtual and mobile applications aimed at cultural sites, demonstrating not only the existence but also the adoption of modern technologies in the tourism industry.

The analysis of the perceived impact of digitization on tourist interest shows that over 86% of the tour guides believe that digitization has at least a small positive effect on the attractiveness of cultural and historical sites. The most recognized resources are mobile applications with information about cultural objects and virtual tours, which play significant roles in the appeal of these sites by providing easy and interactive access to information.

In the context of choosing a tourist destination, 82.6% of the respondents state that the ability to access information through digital platforms is an important factor in tourists' decision-making. These data testify to the growing importance of digitization not only as an informational tool but also as a competitive advantage for tourist destinations.

Equally significant is the question of the impact of digitization on the length of tourists' stays, with 43.5% of the tour guides believing that the availability of digital resources can lead to longer stays, and 52.2% considering that these technologies can contribute to extending the tourist season, particularly in the off-season, by attracting tourists who prefer cultural and historical routes.

According to the survey results, further development of digitization is necessary, including the implementation of new innovations such as 3D visualizations, AR applications, and online platforms for cultural events, which can significantly enrich the tourism infrastructure and create new forms of tourist experiences. At the same time, 47.8% of the respondents highlight the need for better training of tour guides in using new technologies, while 30.4% express the opinion that investments in modern technologies and platforms are necessary.

The results of the survey conducted among representatives of various tourism companies along the Bulgarian Black Sea coast regarding the role of digitalization of cultural and historical heritage in the development of cultural tourism provide valuable insights into the current state and prospects of digitalization within the context of the region's tourism industry.

The analysis shows that customer interest in cultural and historical sites is considerable, with 51.9% of respondents indicating that between 25% and 50% of their clients show interest in these sites. Although this interest does not reach dominant levels, it is significant enough to justify the need for more active inclusion of cultural and historical resources in tourism offerings. Nearly 61% of respondents are unaware of digital platforms that offer virtual tours of these sites.

There is strong recognition of the importance of digitalization, with 89.3% of respondents acknowledging the significance of digitizing cultural and historical heritage for the development of the tourism industry. However, only 55.6% of respondents include information on digital resources for cultural and historical sites in their tourism offers, indicating the need for broader integration of these technologies into the practices of tourism firms. Additionally, 71.4% of participants believe that virtual tours increase interest in cultural and historical sites, highlighting their role as a tool for attracting tourists and enhancing the accessibility and interactivity of cultural experiences.

On the other hand, 48.1% of respondents assess the interest in digital resources for cultural and historical sites from foreign tourists as average, while 25.9% rate it as high, indicating significant potential for the development of cultural tourism on the international market through digital technologies.

Regarding the impact of digitalization on tourist decision-making, 53.6% of respondents believe that digital resources significantly enhance the attractiveness of destinations, while 35.7% think they slightly increase their appeal. The issue of extending the tourist season is also crucial, with 64.3% of respondents believing that

digitalization can play a key role in extending the tourist season along the Black Sea, especially by attracting tourists during the off-season months.

The survey also emphasizes the need for active investments in the digitalization of cultural and historical heritage, with 66.7% of respondents believing that these investments will lead to increased tourist flow, and 75% of respondents considering it as a potential stimulus for the local economy.

Respondents identify the main obstacles to the development of digitalization as the lack of qualified personnel (51.9%) and insufficient funding (40.7%).

The results of the surveys show the need to actively integrate innovations in the digitization of cultural and historical heritage, such as mobile applications and virtual tours, in order to increase the attractiveness and accessibility of tourist destinations on the Bulgarian Black Sea Coast. It is also recommended to intensively train tourist guides in the use of new technologies in order to improve the quality of tourist services. Investments in the digitization of cultural and historical resources will stimulate interest in the region and extend the tourist season.

5 Conclusions

The assessment of tourist portals and surveys along the Bulgarian Black Sea Coast reveals the impact of digitalization on enhancing cultural tourism. Websites for cities like Nessebar, Burgas, Varna, and Sozopol show varying levels of performance, highlighting the need for investment in digital technologies to improve user interaction and promote cultural heritage.

Strengths in content quality, regional uniqueness, and mobile compatibility are evident in Nessebar and Burgas portals. However, deficiencies in interactivity, multimedia elements, and virtual tours show the need for features like 3D visualizations and AR apps. These limitations suggest that while the portals showcase cultural wealth, they fall short of providing immersive experiences.

Surveys of tour guides and tourism firms highlight the recognition of digital tools' importance. Many respondents believe mobile apps and virtual tours enhance the appeal of cultural sites, extend the tourist season, and encourage longer visits. However, the lack of understanding and use of these tools by tourist enterprises signals untapped potential. This emphasizes the need for targeted training and better integration of digital platforms into tourism services.

Though international visitors express interest in digital resources, the scarcity of virtual tours and interactive materials limits their impact. Additionally, ineffective advertising and limited social media presence hinder the region's appeal. Investing in digital technology could significantly improve the area's global competitiveness.

The economic benefits of digitalization are also evident. Many participants believe that digital investment could boost local economies and tourism. However, challenges like inadequate budgets and a lack of skilled professionals must be addressed to unlock digitalization's full potential.

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