Check for updates

(REVIEW ARTICLE)

Emerging directions and obstacles in the digital transformation of cultural heritage

Doina Vicol *

Economic, Department of Marketing and Tourism, Republic of Moldova, Moldova State University, Chisinau City.

Abstract

As digitalization continues to expand across various sectors of society, cultural heritage has increasingly become a focal point. This study explores the evolving trends in the digital transformation of cultural heritage and examines the key challenges involved. By analyzing existing literature and relevant documents, the research reveals that technologies such as artificial intelligence, 3D modeling, augmented and virtual reality, and the Internet of Things are collectively enhancing the accessibility and interactivity of cultural heritage, thereby boosting its relevance among contemporary audiences. Nevertheless, the study also identifies significant barriers, including insufficient technological infrastructure and limited financial investment, which hinder the successful implementation and sustainability of digital heritage initiatives.

Keywords: Digitalization; Cultural Heritage; Artificial intelligence; Technology infrastructure; Financial pressure

1. Introduction

Over recent years digitalization has become a key trend across several spheres of society and the aspect of cultural heritage has not been an exception. The area of cultural heritage has come out to be facing several challenges while sustaining within the highly digitized and modern world due to their contemporary approaches. Cultural heritage has come out as a crucial component of society and preserving it for the future generation is essential in order to carry forward the identities, beliefs and knowledge. Hence, in an effort to guard the unique and rich cultural heritage, researchers have been increasingly focused on the integration of new technologies and developmental efforts through the use of elements like artificial intelligence that has been influential towards bringing major improvements in the current state of cultural heritage (Ibaraki 2019).

Aim

The aim of the following report is to analyses various new trends as well as challenges in terms of digitization and development of the cultural heritage.

Objectives

- To analyze the key technologies being used to digitalize the cultural heritage
- To evaluate the challenges faced in digitization of cultural heritage and recommend a range of strategies for overcoming them in the upcoming years

---

* Corresponding author: Doina Vicol

2. Material and Method

2.1. Materials Used

The choice of relevant materials and methods plays a vital role in deriving appropriate outcomes within the study. For the purpose of the following report, secondary qualitative methods and approaches towards data collection have been taken mainly because of its ease and convenience for collecting and analyzing data, especially for the novice researchers. In addition to that the use of qualitative approaches towards data further leads to improving the understanding of the audience and improves dedication for utilizing the outcomes of the study across diverse areas. The researcher has been further focused on using the qualitative approach in order to evaluate a range of perspectives regarding the challenges as well as the current trends associated with digitalization of various areas of cultural heritage and the theoretical descriptions obtained through the qualitative approach allowed the researcher to effectively address the research objectives (Basias and Pollalis 2018).

The researcher has mainly focused on the use of a document analysis strategy within the following report where various existing documents and published materials have been evaluated. The considered documents and materials mainly focused on various elements of the research area including the new trends in the market as well as digital tools and techniques associated with preservation of the cultural heritage. The primary reason for using the document analysis strategy has been the is of access to the published and existing document and also in order to address various time and cost constraints since the use of primary sources would be more time taking and also lead to bringing greater cost associated to accessing the primary participants (O'Connor 2019). The materials that have been used for the purpose of carrying out the document analysis included various newspaper articles accompanied by journal articles as well as other published documents available over the internet and obtained from credible sources.

In addition to that, the analysis of the findings have been done through a thematic approach within which the researcher has used the collected data to develop themes by identifying various similarities and patterns within the data. This has been further accompanied by highlighting the key factors associated with friends and challenges of digitization and development of cultural heritage under is theme for individually addressing the research objectives and making it easier for the readers and future researchers to understand the outcomes of the following report.

2.2. Steps taken in Experiment

While considering the initial steps of the experiment the researcher focused on identifying a range of published documents and materials that have come up within the area of digitalization of the cultural heritage. It was accompanied by using an inclusion criterion within which only the documents that have been published over the last five years were taken into consideration since it provided a more updated and credible set of information regarding the digitalization efforts towards the cultural heritage across different markets. After the relevant documents for analysis were shortlisted, the next step of the researcher was evaluating them and finding relevant insights that were useful towards addressing the research objectives. The last step was interpreting the findings where the themes were developed based on the collected data and it was aligned with the objectives to ensure better clarity.

3. Results

Table 1 Secondary Findings

Author	Article Title	Findings
Lian and Xie (2024)	The Evolution of Digital Cultural Heritage Research: Identifying Key Trends, Hotspots, and Challenges through Bibliometric Analysis.	The finding from the following article highlights that one of the key trends within the area of digitalization of cultural heritage has been the increasing demand from customers for getting interactive experience for various elements of cultural heritage which involves collection of cultural elements and display of system facilitating and personalized experience for people that has become increasingly prominent. The finding from the study also highlights that various technology is like internet of things and artificial intelligence has resulted in expanding the contemporary horizons of cultural heritage and bringing scope for new advancements by dissemination of cultural heritage studies and also considering digital cultural heritage as a preservation method targeted towards bringing easier access and also safeguarding them. The article further highlights the elements of Berlin declaration within which right to culture and open access to cultural heritage have been highlighted as the key element and it also outlines the 2011 European

		Strategic Plan that emphasized the need for online access to cultural heritage content creation in order to increase cultural education among a larger population.
Jin and Liu (2022)	Fluid space: Digitization of cultural heritage and its media dissemination.	The finding from the following article highlights that one of the key trends within cultural heritage digitization and development has been the introduction of 3R technologies which includes virtual reality, augmented reality and mixed reality. The study further highlights that the use of these digital technologies is crucial in bringing greater experience and also increasing the sense of immersion among the viewers and audience that makes cultural heritage more interesting in comparison to the contemporary approaches used in museums. The modernization and development approaches through digital technology has further resulted into improving visual imagination of individuals regarding cultural heritage that has further increased its scope for being safeguarded and fast down to the future generations using elements like virtual space and online easier access and experience.
IFLA (2025)	Digital Cultural Heritage: Theory and Practice.	The article published within the International Federation of Library Associations and Institutions highlights that the use of various digital technologies including 3D scanning followed by virtual reconstruction technology, 3D printing, enhanced reality as well as holographic projections have altogether contributed towards becoming the key trends in development of cultural heritage. The article also highlights that the use of these technologies has been mainly in terms of creating a diverse range of cultural experiences which are easy and convenient to be used for the audience and also ensures lack of any harm being caused to the antique or cultural elements.
De La Porte and Higgs (2019)	Challenges in digitization of cultural heritage material in the Western Cape, South Africa.	The article explores various trends and challenges associated with the digitalization of cultural heritage by taking the context of South Africa within which they are a diverse range of cultural elements that have been constantly preserved for the past centuries. There are been several challenges that have come up in the digitalization and development of cultural heritage which includes absence of adequate financial resources since the process of digitalization includes the integration of several modern day tools and software as well as hardware which altogether requires a significant amount of investment to be made by various institutions. However across several markets and areas involving South Africa, financial resources come out to be a key constraint when such digitization projects are not adequately funded resulting in lack of sustainability of the project and also reduces the quality of the services. The article highlights another key challenge to be in terms of adoption of standard where various digitization projects of cultural heritage are required to be adapted to the existing guidelines associated with metadata and the inability to do so or failure of using such standard format come up as an obstacle in the development of the digitization projects.
Pandey and Kumar (2020)	Exploring the Impediments to digitization and digital preservation of cultural heritage resources: A selective review.	The findings from the article focus on understanding various challenges associated with digital preservation of cultural heritage where it was found that technical issues were one of the most critical elements obstructing the digitization process. The authors further highlight that the lack of adequate ecology infrastructure across several developing and underdeveloped countries that hold a major amount of cultural heritage followed by inadequate storage devices that are unable to be compatible with the cultural heritage elements and materials which are fragile in nature also result in making the digitalization processes and projects obsolete resulting loss of effort and data. They also add that various legal issues also stand as a key constraint since there are several legal aspects including intellectual property rights as well as other similar guidelines and standards that are required to be considered during any digitization project of cultural heritage. Within that aspect, an example has been highlighted where elements of indigenous collection were often claimed ownership by the indigenous people resulting in lack of their integration within the cultural heritage digitization projects.
Katifori et al. (2023)	Editorial for the special issue "advanced technologies in digitizing	The article focuses on both trends as well as challenges where a primary challenge found by the authors were the inability of conceptualizing and designing proper applications that can uphold the cultural heritage as it is without any decline in their value. Apart from that they also highlight that several trends have come up in the present including digital storytelling along with augmented and extended reality as well as chat what that overall have been helping the audience and viewers to have better understanding of the cultural

	cultural heritage".	heritage by providing them with information regarding different cultural elements leading to bringing a more wholesome and interactive experience for them.

4. Discussion

While considering the key trends associated with digitalization and development of cultural heritage, the majority of the published materials and existing studies have highlighted the introduction of digital tools to be crucial in improving the experience of the viewers and audience by providing them with more interactive experience. Authors have highlighted the introduction of various measures that include digital storytelling that have become highly popular in the present day within the area of digitalization, and it has been found to be interpreting information regarding various cultural elements and heritage sites for the audience and also providing answers to different queries of the audience instantly. At the same time the use of 3D modelling and 3D printing along with other technology like virtual and augmented reality have come up as another key trend and further contributed towards development of virtual museums that can improve perseverance of the cultural artifacts and also reduce the chances of harm to them. Authors have further highlighted that elements like artificial intelligence have further contributed towards the redevelopment of various extinct cultural heritage artifacts using 3D modelling and other similar technology that has increased the scope for saving several cultural elements and also ensuring their availability and access for future generations.

However, at the same time, various authors have also highlighted a range of challenges associated with the digitization process, among which the most prominent challenge that has been outlined across the majority of the published articles has been that of financial constraints. Within that aspect, the lack of adequate technology infrastructure and also inadequate investment on various digitization projects have resulted in reducing their effectiveness and also resulted in loss of efforts and time. Another vital challenge that has been highlighted across several studies has been the legal challenges within which intellectual property rights and ownership of several cultural artifacts and elements often raise issues in terms of their digitalization since certain cultural groups prefer their artifacts and elements to be stored in a contemporary manner.

5. Conclusion

The report mainly focused on the understanding of several new trends as well as the challenges within the area of development as well as digitization of cultural heritage. With secondary qualitative methods including the selection of document analysis approach, it was found that some of the key trends included the use of artificial intelligence as well as technology like 3D modelling and augmented or virtual reality that resulted in bringing customized and interactive experience for the audience. It was also found that the use of elements like the internet of things and chatbots has resulted in bringing the elements of cultural heritage closer to people by making them more accessible and easier to understand. However, it also included a range of challenges ranging from financial issues that came up in terms of lack of adequate investment on such digitization projects followed by intellectual property right related conflicts and technical issues involving lack of adequate technology infrastructure that are essential for digitization projects to be successful.

References

[1] Basias, N. and Pollalis, Y., 2018. Quantitative and qualitative research in business & technology: Justifying a suitable research methodology. Review of Integrative Business and Economics Research, 7, pp.91-105.

[2] De La Porte, B. and Higgs, R., 2019. Challenges in digitisation of cultural heritage material in the Western Cape, South Africa. South African Journal of Information Management, 21(1), pp.1-11.

[3] Ibaraki, S. 2019. Artificial Intelligence For Good: Preserving Our Cultural Heritage. Forbes. [online] 29 Mar. Available at: https://www.forbes.com/sites/cognitiveworld/2019/03/28/artificial-intelligence-for-good-preserving-our-cultural-heritage/ [Accessed 17 Jan. 2025].

[4] IFLA 2025. Digital Cultural Heritage: Theory and Practice. [online] IFLA. Available at: https://www.ifla.org/news/digital-cultural-heritage-theory-and-practice/ [Accessed 17 Jan. 2025].

[5] Jin, P. and Liu, Y., 2022. Fluid space: Digitisation of cultural heritage and its media dissemination. Telematics and Informatics Reports, 8, p.100022.

[6] Katifori, A., Antoniou, A., Damala, A. and Raftopoulou, P., 2023. Editorial for the special issue "advanced technologies in digitizing cultural heritage". Applied Sciences, 13(10), p.5873.

[7] Lian, Y. and Xie, J., 2024. The Evolution of Digital Cultural Heritage Research: Identifying Key Trends, Hotspots, and Challenges through Bibliometric Analysis. Sustainability, 16(16), p.7125.

[8] O'Connor, J., 2019. Document analysis. In Practical Research Methods in Education (pp. 67-75). Routledge.

[9] Pandey, R. and Kumar, V., 2020. Exploring the Impediments to digitization and digital preservation of cultural heritage resources: A selective review. Preservation, Digital Technology & Culture, 49(1), pp.26-37.