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## EVOLUTION OF ONLINE EXHIBITIONS IN THE CONTEXT OF DIGITAL TRANSFORMATION

**Abstract.** *This article comprehensively analyses the stages in the formation of online exhibitions within the process of museums' digital transformation, their theoretical foundations and their role in contemporary museum practice. The study examines the historical and conceptual transition from traditional exhibition practices to digital exhibitions driven by the rapid development of Internet technologies since the 1990s. Furthermore, the research explores the scientific and practical significance of online exhibitions through the theoretical perspectives of Walter Benjamin's concept of the "aura" of the artwork and Ross Parry's digital museum framework, while also considering the international standards and guidelines established by ICOM, UNESCO, CIDOC CRM and Spectrum. The findings demonstrate that digital museums have become a strategic instrument for the preservation, accessibility, interpretation and dissemination of cultural heritage, while simultaneously expanding opportunities for scholarly research and enhancing public engagement through innovative digital technologies.*

**Keywords:** *digital museum; virtual exhibition; online exhibition; cultural heritage; ICOM; UNESCO; CIDOC CRM; Spectrum; digitization; digital heritage.*

## INTRODUCTION

Preserving cultural heritage and transmitting it to future generations is one of the important directions of human development. Cultural heritage is the spiritual wealth of a nation, a mirror of its past and the foundation of its future (President of the Republic of Uzbekistan, 2018). One of the most important institutions carrying out this task

is the museum. The traditional museum concept is based on the physical presence of the original artefact, its historical context and direct communication with the visitor – precisely what Walter Benjamin termed the “aura” of the work of art (Benjamin, 1936/2008).

At the turn of the twenty-first century, rapid advances in information and communication technologies triggered a fundamental transformation in museum operations. The Internet, digital technologies, three-dimensional modelling, artificial intelligence and cloud computing elevated the scientific, exhibition and educational functions of museums to an entirely new level, giving rise to concepts such as the “virtual museum,” the “digital museum” and the “online exhibition.” Today, online exhibitions are recognised not merely as tools for remote display, but as modern platforms for preserving cultural heritage, supporting scientific research, enabling digital communication and engaging a global audience (Parry, 2007).

The purpose of the present article is to trace the historical evolution of online exhibitions through their principal developmental stages, to analyse the theoretical foundations that underpin them, and to assess the significance of international standards in ensuring the scholarly reliability and interoperability of digital museum practice.

## MAIN PART

The historical evolution of online exhibitions may be observed through several distinct stages. The first stage took place between the 1990s and 2000, during the widespread rise of the Internet, when museums focused primarily on digitizing their collections and creating electronic catalogues. The platforms developed during this phase were essentially basic databases in which users could view only brief descriptions of artefacts and low-quality images. The primary objectives of this stage were the inventorying of museum collections, the systematisation of scientific data, the provision of remote access for researchers and the safeguarding of museum holdings. During this period, leading institutions such as the British Museum, the Metropolitan Museum of Art, the Smithsonian Institution and the Louvre launched their initial web platforms.

The second stage, spanning from 2000 to 2010, was catalysed by increased Internet speeds and the emergence of Flash, XML and HTML5 technologies, which accelerated the development of virtual exhibitions. By this time, three-dimensional modelling,

panoramic imaging, virtual tours and multimedia materials had been integrated into museum practice. Parry (2007) characterises this phase as the era of “digital museum transformation,” emphasising the museum’s evolution from a simple information provider into an interactive centre of knowledge.

The third stage, spanning from 2010 to the present day, has seen online exhibitions transform into fully independent cultural platforms as a result of advances in Gigapixel technologies, virtual reality (VR), augmented reality (AR), artificial intelligence (AI) and cloud computing. International projects such as Google Arts & Culture, Europeana and Smithsonian Open Access have made millions of artefacts accessible to a global audience (Europeana Foundation, 2023). Consequently, museums have evolved to serve simultaneously as repositories, research centres, media platforms and institutions of digital communication.

The operations of today’s digital museums are closely aligned with international conceptual frameworks. ICOM defines a museum as an inclusive and open institution that serves the development of society. UNESCO’s Charter on the Preservation of Digital Heritage (2003) recognises digital heritage as a new cultural asset for humanity and calls for its systematic preservation and broad accessibility. At the same time, CIDOC CRM (ISO 21127:2023) ensures a unified information exchange among museums of different countries by semantically linking museum data, and the application of these standards further refines virtual exhibitions in terms of scholarly reliability.

In recent years the digital transformation of global museology has accelerated, shaping new models for museum collection management, scientific documentation and exhibition organisation. Museums in developed countries have succeeded not only in preserving collections but also in integrating them into the global scholarly information space by implementing international management standards such as the ICOM Code of Ethics, CIDOC CRM, Spectrum 5.1, Dublin Core and IIIF – the International Image Interoperability Framework (Parry, 2007).

Leading institutions such as the British Museum, the Smithsonian Institution, the Rijksmuseum, the Louvre and the Metropolitan Museum of Art have made millions of objects from their collections openly accessible in high-resolution digital formats. In these museums artefacts are presented not merely as images but alongside their creation history, provenance, conservation stages, bibliography, three-dimensional models and

semantic metadata. The Europeana platform unites the collections of thousands of European museums, libraries and archives into a single information space, presenting millions of cultural objects on the basis of a unified standard (Europeana Foundation, 2023). The metadata system designed on this platform, based on CIDOC CRM and the Europeana Data Model (EDM), makes it possible to link collections from different countries, enabling users to study comprehensively the information related to a single historical event or cultural object across multiple museum collections.

In the museums of Uzbekistan, significant reforms have been carried out during the years of independence to modernise the system of preserving and accounting for museum collections (President of the Republic of Uzbekistan, 2018). Initial practical experience has emerged in national museums regarding the creation of electronic catalogues, the digitisation of collection documents, the enrichment of exhibitions with multimedia tools and the organisation of virtual exhibitions. However, the collection management system in most local museums is still based on traditional inventory books, local databases and internal electronic accounting systems. This limits the opportunities for international data exchange, systematic linking and the integration of collections into global scholarly platforms.

A significant disparity is also observed in the organisation of digital exhibitions. While foreign museums organise virtual exhibitions using VR, AR, 360-degree panoramas, Gigapixel images and elements of artificial intelligence, virtual exhibitions in Uzbek museums are mainly limited to two-dimensional images and multimedia presentations. This limits the interactive participation and immersive experience of users. Nevertheless, one of the key advantages of Uzbek museums is the uniqueness of the national cultural heritage: the wealth of rare archaeological finds, applied art specimens and historical manuscript collections. Digitising these collections on the basis of international standards and integrating them into global platforms will not only expand the scope of scientific research but also significantly strengthen the country's cultural diplomacy and tourism potential.

From this perspective, the following priority directions may be recommended for the museums of Uzbekistan: the gradual implementation of Spectrum 5.1 and CIDOC CRM standards in collection management; the creation of a unified national digital museum platform for all state museums; the connection of collections to international

data networks on the basis of Linked Open Data principles; the wide use of VR, AR and three-dimensional technologies in virtual exhibitions; the implementation of systems for automatic metadata generation and artefact description based on artificial intelligence; and the organisation of joint virtual exhibitions with international museums and the development of open scientific data exchange.

Analysis shows that online exhibitions create a number of strategic advantages: the democratisation of cultural heritage; the elimination of geographical boundaries; open databases for scientific research; inclusive educational opportunities; accessible use for persons with disabilities; and the introduction of younger generations to cultural heritage. At the same time, issues such as the digital divide, copyright, data security and platform monopolies remain urgent.

## CONCLUSION

Online exhibitions represent a new stage in the development of museology. The digitisation process does not deny traditional museum activity but enriches it with new scientific and communicative tools. Modern museums are becoming active participants in the global digital knowledge space rather than merely institutions that preserve cultural assets. Online exhibitions organised on the basis of ICOM, UNESCO, CIDOC CRM and Spectrum standards are the most important means of ensuring scientific reliability, openness and international integration (Parry, 2007; UNESCO, 2003).

In the future, the development of artificial intelligence, immersive technologies and semantic databases is expected to turn online exhibitions into an even more interactive and scientifically advanced system. The experience of Uzbekistan shows that the uniqueness of the national heritage offers a strong foundation for this transformation, provided that international standards are systematically adopted and digital infrastructure is strengthened.

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