



Investigating the behavioural intentions of museum visitors towards VR: A systematic literature review

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ABSTRACT

This study investigates the behavioural intentions of museum visitors towards Virtual Reality (VR) technology, spanning the years 2010–2023. It evaluates literature quality, explores research theories, and identifies trends. Findings indicate that most museum visitors hold positive attitudes towards VR, necessitating further research on generational perspectives. Quantitative research methods dominate (77.8%), with 38.9% employing the Technology Acceptance Model (TAM) or its extensions. Key influencing factors include perceived usefulness, information quality, perceived ease of use, and psychological cognition. The study underscores the importance of comprehending generational differences among museum visitors and advocates for adopting comprehensive theoretical models in future research within the museum domain. This research contributes to understanding how museum visitors engage with VR technology, emphasising nuanced approaches considering generational variations and recommending more inclusive theoretical frameworks.

1. Introduction

Virtual Reality (VR) technology transcends physical limitations, immersing users in simulated environments through computer-generated visuals, sound, and sensory stimuli (Lee et al., 2023; Li & Cesar, 2023). VR technology is extensively employed in museums, offering visitors immersive experiences distinct from traditional exhibition methods (e.g., Arayaphan et al., 2022; Baradaran Rahimi et al., 2022; Shahab et al., 2023).

While exploring VR within museums, it is crucial to differentiate it from other immersive technologies like Augmented Reality (AR) and Extended Reality (XR). Despite often being grouped under the XR umbrella, each offers distinct affordances and experiences for museum visitors (Silva & Teixeira, 2021, December). VR fully immerses users in a virtual environment, while AR overlays digital elements onto the physical world. XR encompasses both VR and AR, aiming to blend real and virtual worlds seamlessly. Recognising these nuances enhances our understanding of immersive technology's potential within museums.

In a museum setting, VR devices allow visitors to travel time and space, immerse themselves in historical cultures or the significance of exhibits, and overcome space limitations museums often face (Chung

et al., 2024). This represents a highly effective and innovative approach to exhibition. For instance, limitations in physical space make displaying numerous valuable cultural artefacts impractical. VR technology presents a solution with its “artefact storage room”, offering unlimited space for preservation and display (Querette, 2022). Visitors can explore damaged or previously unrevealed exhibits (Schofield et al., 2018).

AR, on the other hand, overlays digital elements onto the existing physical environment, enriching surroundings with contextual information or interactive experiences (Khalil et al., 2023; Panhale et al., 2023). XR encompasses both VR and AR, aiming to blend real and virtual worlds seamlessly. VR sits on one end, fully immersing users, and AR on the other, enhancing users' surroundings. XR experiences could combine elements of both, leading users through a historical event while seamlessly transitioning between physical exhibits and augmented scenes (Shahab et al., 2023; Sylaiou et al., 2023, 2024).

Governments worldwide actively support VR integration into museums. Initiatives like the UK's “Museum Digitalisation” plan (Department for Digital Culture, Media & Sport, 2018), the US National Science Foundation's funding programs, and Australia's “Digital Culture Fund” (Australian Museums and Galleries Association, 2019) provide financial resources, technical guidance, and encouragement for museums to

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adopt VR technology in exhibitions and digitisation projects. This growing government support reflects the recognition that VR fosters cultural preservation, education, the digital economy, and creative industries, foreshadowing significant expansion of VR use in museums to enhance visitor experiences.

Renowned museums are at the forefront of integrating VR technology. The Louvre's groundbreaking "Mona Lisa: Beyond the Glass" (Louvre Museum, 2021; Robaina-Calderín et al., 2023) offers an intimate dive into the masterpiece's details. Other museums, such as the British Museum, employ VR technology to create the virtual exhibition "Defining Beauty", allowing visitors to explore ancient Greek and Roman artworks through VR headsets (Mamur et al., 2020). With the continuous advancement of VR technology, more museums are poised to adopt VR devices to create immersive and interactive exhibition experiences (Chung et al., 2024; Mirza et al., 2024). Other notable VR exhibitions include the Battle of Neretva, a VR application at the Museum of Jablanica, Bosnia and Herzegovina (Rizvic et al., 2022) and Getty Museum's "Together: Join the Crowd in Celebrated European Paintings" project (Getty Museum, 2021).

VR headsets, typically equipped with high-resolution screens and binaural audio for spatial realism, create immersive experiences by tracking head movements via accelerometers and gyroscopes, translating them into corresponding changes in the virtual world (Angelov et al., 2020; Luma, 2022). The past decade has seen a surge in commercial viability due to hardware advancements, content development, and increased accessibility through platforms like SteamVR and Oculus Quest (Hutson & Fulcher, 2023).

VR has transformed museum experiences, propelling visitors into immersive journeys through art and history. Research suggests immersive VR can enhance engagement and learning in museum settings (Leow & Ch'ng, 2021), allowing for interactive exploration and increased accessibility to otherwise inaccessible sites or artefacts (Çiftçi & Çizel, 2024).

However, while technological advancements in VR museums have garnered much attention, a crucial piece remains largely unexplored: visitors' actual attitudes and motivations towards this innovative technology. Existing reviews, like Zhou et al. (2022), have done a commendable job of showcasing the potential and applications of VR in museum learning. However, our study takes a critical step further by adopting a user-centric perspective. We delve beyond the technical intricacies to investigate how museum visitors perceive, engage with, and ultimately decide to adopt VR experiences.

While the potential of VR technology in museums is vast, the focus on technological development tends to overshadow its primary purpose – enhancing the museum visitor experience (Little et al., 2020; Shehade & Stylianou-Lambert, 2020).

Focusing on behavioural intentions fills a significant gap in existing research. We analyse various factors influencing visitors' decisions to embrace VR, from perceived ease of use and enjoyment to cultural and social influences. This deeper understanding of visitor motivations and potential barriers will offer valuable insights for museums seeking to optimise their VR offerings and foster meaningful visitor engagement.

Behavioural intention refers to users' subjective feelings and emotional responses when using products or services (Martin et al., 2008). It constitutes a crucial indicator of the success of high-quality VR product design. Factors influencing users' behavioural intentions while using VR devices are multifaceted, making an understanding of museum visitors' behavioural intentions paramount in ensuring the continued positive development of VR technology in museums (Atzeni, Del Chiappa, & Mei Pung, 2022).

While a growing body of research explores the use of VR in museums, focusing primarily on technological advancements and museum operations, a crucial gap remains in understanding visitor experiences and preferences across generations. Thus, this review article addresses this gap by synthesising existing research (2010–2023) to answer three key questions:

[RQ1]. What theories or theoretical models have been utilised in previous research to understand museum visitors' behavioural intentions towards VR?

[RQ2]. What are museum users' attitudes and behavioural intentions towards VR design and implementation?

[RQ3]. Do existing studies identify factors influencing user behavioural intentions towards VR in museum settings, and if so, how do these factors vary across different age groups (generational differences)?

This study explores museum visitors' behavioural intentions concerning VR devices through a systematic literature review (SLR). It assesses the quality of literature, examines the theories employed, analyses research methodologies, explores attitudes of acceptance and behavioural intentions towards VR technology among museum visitors, and summarises the factors impacting these intentions.

Furthermore, analysing generational differences in user acceptance and preferences will inform the design and implementation of VR experiences that cater to diverse audiences, ensuring equitable access and engagement across age groups. This novel approach contributes to the existing literature by bridging the gap between technological advancements and user-centred understanding of VR integration in museums.

An initial search validates the novelty of this review, as no prior studies have focused specifically on museum users' behavioural intentions towards VR technology. While insightful systematic reviews have examined the application of VR (encompassing VR, AR, and XR) in diverse fields like hospitality and tourism (Jingen Liang & Elliot, 2021; Chen, Wu, & Wai Lai, 2023; Yung & Khoo-Lattimore, 2019; Asyraf et al., 2023; Zhou et al., 2022), they have not addressed behaviour intentions or generational differences as highlighted in Table 1.

Table 1 presents existing systematic literature reviews focusing on immersive museum interactive technologies in museums. While these reviews acknowledge the advancements and potential of such technologies, they have not explicitly explored user behavioural intentions. However, they recognise the crucial role of user experience and preferences in influencing intentions, evident in their discussions on "visitor experience" and "future trends.". For example, Komianos (2022) highlights the needs of novice users for assistance and time, as well as potential user embarrassment when operating devices in public. They also suggest the Technology Acceptance Model (TAM) as a potential framework for future research. Similarly, Hijazi and Baharin (2022) emphasises the importance of "visitor-centric" approaches using digital technology to engage and enhance interaction.

These insights, along with studies by Lee et al. (2020), Kamariotou et al. (2021), Komarac and Ozretić Došen (2022), and Zhang and Abd Rahman (2022) underscore the interconnectedness of visitor intentions and technology development in museums. This current study aims to address this gap in research on user behavioural intentions towards VR technology.

By synthesising existing research analyses, theoretical perspectives, and viewpoints on museum user acceptance of VR devices, this review aims to provide valuable insights and fill the gap in this understudied area.

2. Article screening and collection: focus on recent development

2.1. Articles coverage

This study's research spans 2010 to 2023 (cutoff: July 2023) to capture the latest advancements in VR technology and its application in museums. Choosing 2010 as the starting point is justified for several reasons. VR technology has undergone a remarkable evolution, marked by distinct stages characterised by significant leaps and bounds in capabilities. The early 1960s ushered in pioneering prototypes like Sensorama, laying the groundwork for sensory immersion (Gutierrez, 2023). The 1990s saw a wave of commercial aspirations with VR arcades