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NARRATIVE REVIEW: THE SYNTHESIS OF METAVERSE AND AR TECHNOLOGIES IN GRAPHIC ART EXHIBITIONS THROUGH SPATIAL.IO AND ADOBE AERO

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**Abstract:**

This narrative review investigates the synthesis of metaverse and augmented reality (AR) technologies in graphic art exhibitions, focusing on Spatial.io and Adobe Aero. It aims to evaluate their individual and combined impact on curatorial practice, viewer engagement, and exhibition aesthetics. As graphic art exhibitions increasingly transition from physical spaces into immersive digital environments, platforms like Spatial.io and Adobe Aero have emerged as pivotal tools. However, a comprehensive understanding of how these technologies function in tandem, particularly in shaping hybrid exhibitions, remains underdeveloped. A comprehensive literature search was conducted across Scopus, Web of Science, Google Scholar, ACM Digital Library, and IEEE Xplore, targeting publications from 2015 to 2025. Keywords related to metaverse, AR, graphic art, and exhibition design guided the search. Peer-reviewed articles, white papers, and case studies were synthesized by using Prisma framework. Spatial.io facilitates immersive, multi-user virtual galleries, while Adobe Aero enhances site-specific, mobile-based AR interaction. Though each platform presents unique strengths, their combined use in curatorial workflows is rare and underexplored. Key challenges include technical integration, user accessibility, and long-term sustainability. The review identifies a gap in cross-platform strategies and calls for interdisciplinary frameworks that support hybrid exhibition design. This review contributes a conceptual framework for understanding and applying Spatial.io and Adobe Aero in graphic art exhibitions. It advocates for empirical research, cross-platform design models, and institutional support to advance equitable, immersive, and sustainable digital art curation.

Keywords:

Metaverse, Augmented Reality, Graphic Art, Spatial.io, Adobe Aero, Digital Exhibitions

Introduction

In an era marked by the convergence of physical and digital experiences, the integration of metaverse and augmented reality (AR) technologies is reshaping how graphic art is created, exhibited, and experienced (Spais & Jain, 2025). Graphic art exhibitions once limited to physical galleries are now expanding into immersive digital realms, catalysed by platforms such as Spatial.io and Adobe Aero, Cao, N. (2025). Spatial.io offers a metaverse-based space where artists and viewers can interact within 3D environments, (Arief et al., 2025), while Adobe Aero enables dynamic, location-based AR content that blends physical surroundings with digital overlays, (Thi Vo, 2025). Despite growing interest, critical analysis of these tools in the context of graphic art curation and viewer engagement remains limited, (Darda et al., 2025). Existing literature tends to explore either technical capabilities or isolated case studies, lacking a comprehensive synthesis of how these technologies collectively influence exhibition aesthetics, accessibility, and interaction (Christou et al., 2025). This narrative review focuses on the synthesis of Spatial.io and Adobe Aero in graphic art exhibitions, aiming to evaluate their complementary roles, design frameworks, and experiential outcomes. “Metaverse” refers to interconnected virtual spaces where users engage via digital avatars, and “AR” denotes technology that overlays virtual elements onto real-world environments. This review will examine their integration from curatorial, technological, and experiential perspectives. It offers timely insight into a rapidly evolving field, providing a conceptual framework for artists, curators, and researchers.

To support the integration of its theory, this study employs the Virtuality Continuum framework by Milgram and Kishino (1994) and Skarbez et al. (2021) as the basis for analysis. This framework allows a clear mapping of the positions of Spatial.io and Adobe Aero within the mixed reality spectrum and assists in structuring the relationships between technical, curatorial, and audience experience dimensions systematically. This approach is not only relevant to current developments but also provides a methodological foundation for future research in digital art exhibitions.

Methods

To conduct this narrative review on the synthesis of metaverse and augmented reality (AR) technologies in graphic art exhibitions through Spatial.io and Adobe Aero, a comprehensive literature search was performed across several academic and gray literature sources. The primary databases searched included **Scopus**, **Web of Science**, and **Google Scholar**, along with supplementary exploration of relevant articles and reports found on **ACM Digital Library**, **IEEE Xplore**, and **ResearchGate**. Additional references were identified through backward citation tracking of key studies.

Search terms and Boolean combinations included:

("metaverse" OR "virtual reality" OR "digital environment" OR "immersive space") AND ("augmented reality" OR "AR" OR "mixed reality" OR "enhanced reality") AND ("graphic art" OR "visual art" OR "art exhibition" OR "art display") AND ("synthesis" OR "integration" OR

"combination" OR "fusion") AND ("interaction" OR "engagement" OR "experience" OR "participation")

Filters were applied to limit results to **English-language** publications from **2015 to 2025**, ensuring focus on current technological developments and applications. Peer-reviewed journal articles, conference proceedings, industry white papers, and practice-based case studies were all considered.

Inclusion criteria focused on studies and documents that: (1) examined the use of Spatial.io and/or Adobe Aero in the context of graphic art or exhibition design; (2) discussed user experience, curatorial practice, or technological integration; and (3) provided conceptual or applied insights. Exclusion criteria included sources unrelated to graphic arts, those focused solely on gaming or unrelated AR/VR applications, and non-English documents without translation.

Result

Figures 1 and 2 present visual examples of how digital exhibition environments are realized through the use of Spatial.io and Adobe Aero technologies. In Figure 1, the Spatial.io interface displays a virtual gallery environment that houses graphic exhibition materials and QR codes, allowing visitors to access additional experiences through an augmented reality (AR) application. This 3D environment feature provides navigation and interaction capabilities resembling physical experiences within a digital space. Meanwhile, Figure 2 illustrates the AR experience generated via Adobe Aero when visitors scan the QR codes. The exhibition's graphic elements are directly mapped onto the real-world environment, producing interactions that integrate virtual elements into physical space. This application supports the concept of presence in mixed reality, where visitors are actively engaged through 3D visuals, multimedia content, and real-space interactions. Visual analysis of both figures demonstrates how the combination of metaverse exhibition platforms and AR enhances user engagement not only visually but also through the integration of virtual and physical worlds, supporting a more immersive learning and appreciation experience of graphic arts.

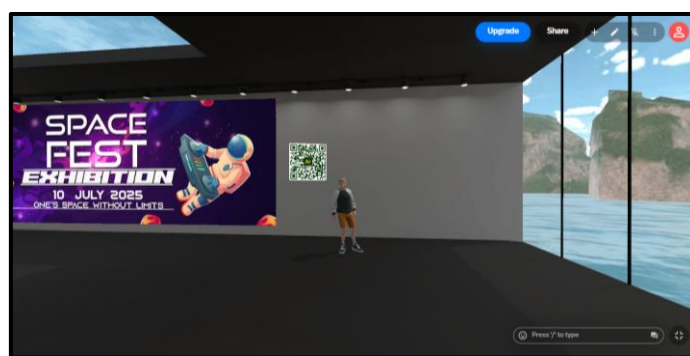


Figure 1: Spatial io Graphical User Interface (GUI), Actions Setup [Screenshot]

Source: (Adilah, 2025)



Figure 2: Adobe Aero Augmented Reality Display Using QR Code Attachment from Spatial.io Metaverse with Action Setup, Applied to Real-world [Screenshot]

Source: (Adilah, 2025)

Figure 3 presents the multisensory experience generated through the integration of augmented reality (AR) technology and the metaverse environment. This display illustrates how virtual visual elements, such as 3D objects, exhibition graphics, and user avatars, are directly mapped onto the real physical space. This interactivity allows visitors to move freely between the virtual and real worlds without losing the continuity of the exhibition experience. From a visual pedagogy perspective, such a display supports immersive learning by providing visitors the opportunity to explore, observe, and actively engage with exhibition content through a more experimental and contextual learning approach. Additionally, the spatial integration highlights the potential of using AR as a content delivery medium that is not only more engaging but also capable of enhancing the overall depth of the exhibition experience holistically.



Figure 3: Adobe Aero Augmented Reality Display Using QR Code Attachment from Spatial.io Metaverse with Action Setup, Applied to Real-world [Screenshot]

Source: (Adilah, 2025)

Discussion

Synthesis Analysis

Conceptual Foundations: Defining the Metaverse and AR in Exhibition Contexts

The metaverse, as a digitally persistent, immersive environment, allows users to navigate and interact with virtual spaces through avatars (Herath et al., 2024). Spatial.io exemplifies this by enabling real-time social interaction and spatialized content within three-dimensional environments (Obae et al., 2024). Augmented reality (AR), on the other hand, overlays digital elements onto the physical world, (Dargan et al., 2023), enabling hybrid experiences as

demonstrated by Adobe Aero's intuitive, mobile-accessible interface for visualizing and interacting with 3D graphic art (Gudikandula et al., 2025).

Scholars consistently emphasize that while both technologies promote immersion, their ontological basis differs: metaverse environments are fully synthetic, while AR enhances, rather than replaces, physical reality (Steinhoff, 2025). This distinction affects curatorial design, audience reach, and the perceived authenticity of the artwork, introducing important curatorial decisions in graphic art exhibitions (Zhao & Wu, 2025).

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Technological affordances and artistic possibilities

The literature reveals a consensus on the potential of Spatial.io and Adobe Aero to expand spatial narrative, interactivity, and multisensory engagement in art exhibitions (Pietroni, 2025). Spatial.io enables artists to create room-scale, persistent digital galleries accessible from anywhere, supporting collaborative curation and real-time critique (Muñoz et al., 2025). Adobe Aero, in contrast, lends itself to site-specific AR experiences, allowing art to inhabit real-world environments and provoke context-sensitive interactions, (Rissanen, 2025). However, divergent views emerge around accessibility and learning curves. Some practitioners highlight Spatial.io's relatively steep setup process and higher hardware demands, (Zhang et al., 2025) compared to Aero's mobile-first deployment and intuitive authoring tool (Yadav et al., 2025). This raises questions of democratization whether these tools equally empower emerging artists or replicate existing inequalities in access to technology.

Curatorial Practices and Audience Experience

A key strength of these platforms lies in their ability to reshape audience engagement. Studies note that exhibitions in Spatial.io often emphasize social co-presence, facilitating discussion and shared exploration among geographically dispersed visitors, (Kareem et al., 2025). Adobe Aero, conversely, personalizes the experience users encounter artwork through their own device lenses, blurring the line between viewer and participant (Fuchs, 2025).

From a curatorial perspective, technologies such as 3D interactivity in Spatial.io and AR layers in Adobe Aero have a direct impact on exhibition organization strategies. For instance, the interactive points provided in Spatial.io allow curators to structure the exhibition visit flow more systematically while promoting collective visitor engagement. In the context of Adobe Aero, digital content displayed directly within the user's physical space offers a more personalized and immersive experience, thereby enriching the appreciation and interpretation of art. Thus, the relationship between technology and curation can be viewed as a strategic unity that enhances the understanding of hybrid experiences in contemporary art exhibitions.

While curators report increased engagement metrics in both contexts, some critics caution against the novelty effect: the excitement of interactivity may overshadow deeper aesthetic or conceptual engagement (Sun, 2025). Further, concerns persist regarding the impermanence of digital platforms and the potential alienation of audiences uncomfortable with immersive tech.

Integration Challenges and Interoperability

Integrating Spatial.io and Adobe Aero in a single exhibition poses logistical and conceptual challenges (Zhang et al., 2025). These include technical incompatibilities, inconsistent user interfaces, and fragmented audience experiences. Few studies currently explore cross-platform storytelling or interoperable workflows, signalling a gap in both research and practice.

Moreover, platform dependency remains a concern: artists and curators are vulnerable to sudden shifts in proprietary software policies or shutdowns (Fisher, 2020). The lack of open standards for immersive exhibition design complicates long-term preservation and documentation of digital works, (Qi & Wang, 2025).

Implications and Future Directions

The literature suggests that combining Spatial.io and Adobe Aero can yield complementary strengths macro-level immersion with micro-level interactivity but such synthesis demands new models of curatorial planning, cross-disciplinary collaboration, and technical support (Tian et al., 2024).

Future research should investigate best practices for hybrid curation, the impact of immersive technologies on audience cognition and memory, and the development of unified frameworks for evaluating digital exhibition effectiveness (Wen & Ma, 2024). Policy-wise, institutions must address infrastructural disparities and provide professional development for artists and curators navigating this evolving landscape (Sharma et al., 2025).

This synthesis reveals that while Spatial.io and Adobe Aero are powerful tools, their integration into graphic art exhibitions is neither seamless nor neutral it is shaped by technical, cultural, and curatorial considerations that warrant ongoing inquiry (Subaveerapandiyan et al., 2024).

In addition, although these technologies have the potential to democratize access to art, there are socio-cultural implications that require attention. The digital divide between high- and low-capability users, as well as differences in cultural perspectives toward immersive art, can affect audience experience and reception. Therefore, future studies need to examine how socio-cultural factors and digital literacy shape visitor experiences, thereby ensuring more equitable access and participation.

Visitor digital literacy also plays a critical role in the acceptance of AR and metaverse technologies. Users' level of understanding and comfort with immersive technologies influences the extent to which they can fully appreciate the exhibition experience. Hence, experiential strategies and curatorial design must take into account the varying levels of audience digital literacy to ensure exhibitions that are inclusive, effective, and easily accessible to diverse user groups.

Limitations

This methodology ensured a balanced, critical synthesis of current knowledge while maintaining relevance to the review's objectives.

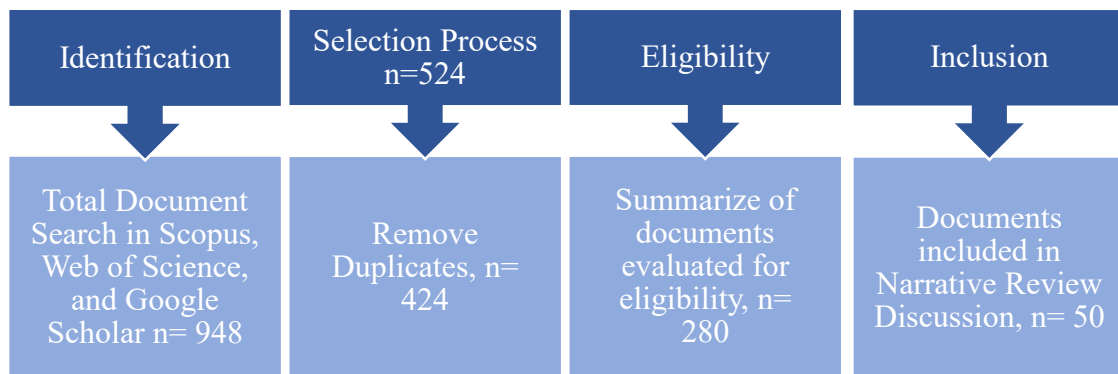


Figure 4: PRISMA-based Flow Diagram of Document Selection Process for Narrative Review: The Synthesis of Metaverse and AR Technologies in Graphic Art Exhibitions through Spatial.io and Adobe Aero.

Seven unique search groups were executed, focusing on both broad and platform-specific aspects of AR and metaverse integration in art exhibitions.

This narrative review, while offering a comprehensive synthesis of metaverse and AR technologies through Spatial.io and Adobe Aero in graphic art exhibitions, is subject to several methodological and evidentiary limitations. First, the inherently non-systematic nature of narrative reviews introduces potential for **selection bias**. While rigorous efforts were made to identify diverse and credible sources, the absence of predefined inclusion and exclusion protocols may have led to inadvertent omission of relevant studies or overrepresentation of favorable outcomes.

Second, **literature on the integrated use of Spatial.io and Adobe Aero remains nascent and fragmented**, with most studies focusing on technical features or isolated case examples rather than comparative or empirical evaluation. As a result, this review relies heavily on anecdotal insights, platform documentation, and early adopter experiences, which may not generalize across broader contexts or user populations. The lack of longitudinal data further limits assessment of sustained impact or user adaptation over time (Tene et al., 2024).

Third, **synthesis challenges arose from disparate terminology and conceptual frameworks** across disciplines such as digital art, interaction design, and immersive technology (Ozdemir, 2022). This may affect coherence and comparability of findings. Additionally, industry-led reports may carry promotional bias, especially in evaluations of Adobe Aero's user experience or Spatial.io's scalability, which were not always independently validated.

To mitigate these issues in future work, researchers should consider **mixed-methods or systematic review designs** that clearly define criteria for literature inclusion (Yin & Do, 2025), apply critical appraisal tools, and evaluate user-centered outcomes across platforms. Longitudinal studies, cross-platform usability testing, and participatory design assessments could yield deeper insights into the effectiveness, accessibility, and ethical implications of these emerging technologies in graphic art exhibitions (MacDowell et al., 2025).

Conclusion

This narrative review synthesized current knowledge on the integration of metaverse and AR technologies in graphic art exhibitions through Spatial.io and Adobe Aero, addressing the

initial objective of evaluating their complementary roles in curatorial design, audience engagement, and experiential aesthetics. The review revealed that while Spatial.io excels in enabling immersive, avatar-driven virtual galleries, Adobe Aero offers intuitive, location-specific AR interactions that enhance real-world art experiences. Together, they present a compelling but underexplored potential for hybrid exhibition strategies that blend macro-level spatial immersion with micro-level contextual interactivity. However, significant research gaps persist around cross-platform interoperability, curatorial best practices, and long-term audience impact. The synthesis also illuminated concerns about access equity, technological impermanence, and platform dependency, highlighting the curatorial and ethical implications of immersive media. To advance the field, future research should focus on empirical evaluations of hybrid exhibition models, develop shared frameworks for immersive design assessment, and investigate the cognitive effects of multisensory engagement. Furthermore, institutions and practitioners should prioritize infrastructure support and inclusive training programs to ensure equitable access to these evolving tools. By addressing these challenges, the field can move toward more cohesive, accessible, and conceptually rich digital exhibition practices that redefine the future of graphic art curation.

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