

Enhancing User Engagement Through Aesthetic Experience in Augmented Reality Comics

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ABSTRACT

Augmented Reality (AR) comics are a new genre of digital storytelling, bringing together immersive technology and visual narratives to offer engaging and interactive reading experiences. AR is being increasingly used in education, cultural heritage, gaming, tourism, and digital media but little research has systematically explored the impact of aesthetic experience and immersive interaction on user engagement in AR comic environments. The present study attempts to fill this gap by systematically reviewing 37 Scopus-indexed publications to summarise the current knowledge on user experiences in AR-based applications. The analysis revealed three major themes: Immersive Engagement, Aesthetic Experience and Interactive Storytelling. The findings suggest that Immersive Engagement is a central mechanism for user engagement. Interactivity, presence, participation and flow experiences enhance cognitive, emotional and behavioural engagement. AR technology allows users to actively participate in digital content, which means sustained attention and meaningful engagement. The second theme, Aesthetic Experience, highlights the importance of visual appeal, sensory stimulation, spatial visualisation and emotional resonance in forming positive perceptions of users. High quality visual design and immersive aesthetics are important factors in enjoyment, satisfaction and emotional attachment to AR content. The third theme, Interactive Storytelling, demonstrates how narrative immersion, user agency, and participatory content exploration enhance the effectiveness of storytelling. By combining narrative structures with AR features, the consumption of content becomes active engagement with the story, whereby users can co-create meaning through interaction. In general, the review implies that aesthetic experience acts as a mediating mechanism for immersive interaction to improve user engagement in AR comics. The study suggests a conceptual framework that immersive interaction influences aesthetic experience, which in turn improves engagement outcomes. These findings contribute to the growing discourse of immersive media and digital storytelling by providing theoretical insights into AR comic design and practical implications for educators, designers, publishers, and creative industries who want to build more engaging and aesthetically meaningful AR narrative experiences.

Keywords: Augmented Reality Comics, Aesthetic Experience, Immersive Engagement, Digital Storytelling

INTRODUCTION

The rapid rise of immersive technologies has changed the way audiences consume, engage with, and experience digital content. One of the most influential technologies among these is Augmented Reality (AR), which allows the combination of digital components with real-world environments to produce engaging and interactive experiences. AR has been extensively used in different domains such as education, cultural heritage, tourism, gaming, journalism, e-commerce, and digital media. Its ability to augment user engagement, immersion, and experiential learning has been widely reported (Dağ et al., 2024; X. Huang et al., 2025; Ngo et al., 2025; Y. Wu & Liu, 2025). As digital audiences are increasingly seeking more participatory and personalised experiences, AR technologies are becoming an increasingly important part of the process of transforming passive media

consumption into active engagement through interactivity, sensory stimulation, and immersive storytelling (H. Li et al., 2025; Tang & Zhang, 2025). Hence, it has become an important research priority for scholars and practitioners to understand the factors that shape user engagement in AR environments to design meaningful and sustainable digital experiences.

Within the larger world of digital storytelling, comics have progressed from traditional print formats to interactive and multimedia-rich environments. The combination of comics and AR technologies has resulted in a new genre known as Augmented Reality Comics, in which static graphic storytelling is supplemented with animation, three-dimensional visualisation, sound effects, spatial interaction, and user participation. This change provides new opportunity to enhance story experiences and engage audiences. Unlike traditional comics, augmented reality comics enable readers to interact directly with plot elements, navigate immersive locations, and influence narrative evolution in real time. These innovations have far-reaching ramifications for visual communication, digital publishing, the entertainment industry, and educational content creation. However, despite the rising technological sophistication of AR apps, the methods by which AR comics produce meaningful engagement are little understood (Cortes et al., 2024; Q. Li et al., 2026)

Recent breakthroughs in immersive visual communication emphasise the need of incorporating aesthetics and engagement into digital storytelling environments. (Yuan, 2026) presented a visual communication framework for cultural and creative products that consists of three interconnected layers: data generation, visual expression, and interactive experience. To build dynamic and engaging user experiences, the framework combines Neural Radiance Field (NeRF) technologies, three-dimensional modelling, digital graphics, augmented reality visualisation, virtual reality scenarios, immersive spaces, gesture control, and motion tracking. Figure X shows how digital material moves from computational data generation to visual representation, and finally to user involvement via immersive technology. The study discovered that combining AR and VR considerably improved spatial perception, user engagement length, visual detail identification, and communication efficacy in digital cultural spaces (Pagliari et al., 2025; Yuan, 2026). These findings indicate that user involvement in immersive media is not primarily controlled by technological functionality, but rather by the intersection of visual aesthetics, immersive surroundings, and interactive experiences. Such insights are especially important for Augmented Reality (AR) comics, where narrative material, graphic design, and user interaction come together to create a multidimensional storytelling experience. As a result, Yuan's theory provides a solid conceptual foundation for understanding how aesthetic pleasure and immersive interactivity enhance user engagement in AR comic contexts.

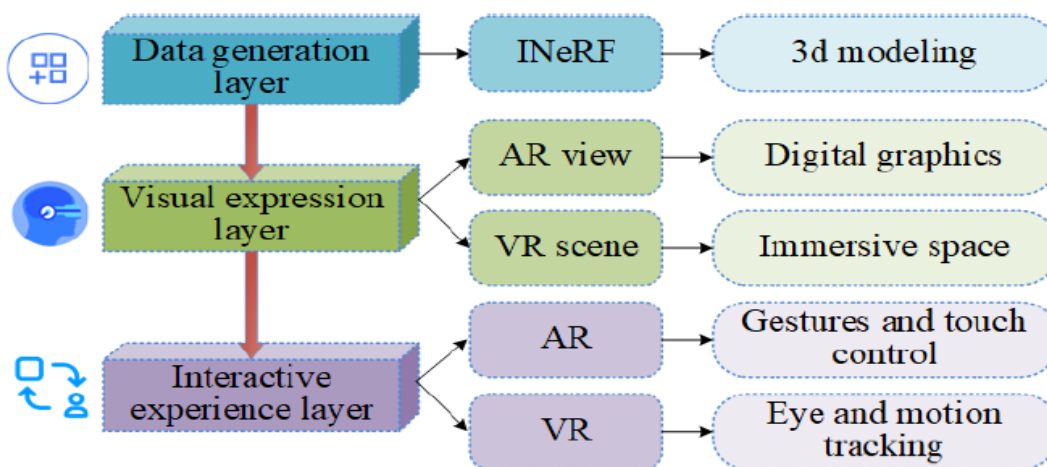


Figure 1: The overall framework of visual communication strategy of cultural and creative products (icons designed by Freepik(Yuan, 2026)

The existing literature places a high emphasis on technology performance, usability, learning outcomes, and interaction design in AR environments. Previous research has found that immersive technologies improve user engagement in cultural heritage applications ((Dogan Turkoglu & Cakıcı Alp, 2025; Srdanović et al., 2025), virtual museums (Huang et al., 2024), educational games (Mcfettridge & Iqbal, 2024), tourism experiences (Wang, 2026) digital journalism (M. Huang et al., 2025) and e-commerce platforms (Ngo et al., 2025). Immersion, interactivity, presence, and engagement outcomes have all been shown in research to be positively related. Similarly, scholars have identified visual appeal, spatial responsiveness, and sensory immersion as important contributors to user satisfaction and emotional involvement in AR experiences (Abbasi et al., 2024; Y. Wu & Liu, 2025). Furthermore, narrative-based AR applications have demonstrated significant potential for enhancing learning motivation, emotional arousal, and user experience through interactive storytelling mechanisms (H. Li et al., 2025; Yu et al., 2024). Despite these developments, three significant limitations remain in the literature. First, existing research focuses on AR applications in educational, tourist, gaming, cultural heritage, and commercial contexts, but AR comics are substantially under-represented as a separate research subject. Although AR comics integrate visual communication, narrative design, and immersive technology, scholarly research into reader engagement with this medium is minimal. Second, earlier research has frequently treated engagement as a direct result of technology aspects such as interaction, immersion, or usability, while ignoring the mediation effect of aesthetic experience. While visual aesthetics are recognised as significant components of user experience (Vijay et al., 2025; Y. Wu & Liu, 2025), little empirical and conceptual research has been conducted on how aesthetic experiences enhance participation inside immersive narrative settings. Third, current research investigates immersion, storytelling, and aesthetics as distinct constructs, resulting in a fragmented knowledge of how these dimensions interact to affect user engagement in AR-based narrative media.

These constraints demonstrate a major theoretical and contextual gap. Theoretically, there is insufficient integration of aesthetic experience theory, immersive media research, and interactive storytelling literature to explain engagement outcomes in AR comics. Existing engagement models frequently prioritise technological features above the emotional, sensory, and experience factors that determine how users interpret and connect with visual tales. Methodologically, most studies depend on isolated investigations of AR applications rather than synthesising evidence from different immersive environments to discover recurring engagement mechanisms. Despite their increasing popularity in digital media ecosystems, the distinct properties of AR comics which integrate visual storytelling, reader engagement, and augmented environments have not been thoroughly investigated. Addressing these gaps is critical because user engagement is now recognised as a multidimensional phenomenon that includes cognitive, emotional, behavioural, and aesthetic reactions, rather than just contact frequency or technological innovation.

As a result, this study aims to evaluate how aesthetic experience and immersive interaction influence user engagement in augmented reality comics by conducting a thorough synthesis of current AR literature. The study's specific goal is to uncover the key characteristics that influence engagement in immersive AR settings, as well as to investigate how aesthetic experiences moderate the relationship between immersive interaction and user engagement. Drawing on evidence from thirty-seven Scopus-indexed papers, the study creates a conceptual understanding of engagement processes pertinent to AR comic design and consumption.

Therefore, this investigation is guided by the following research question:

RQ: How do aesthetics and immersive interactivity affect user engagement in augmented reality comics? To answer this question, the review organises findings around three emerging themes: immersive engagement, aesthetic experience, and interactive storytelling. Immersive Engagement is defined as users' cognitive, emotional, and behavioural participation fostered by interactive AR settings. Aesthetic Experience refers to visual appeal, emotional resonance, sensory stimulation, and artistic appreciation generated by AR interfaces. AR technologies enable interactive storytelling, which focuses on narrative immersion, user interaction, and dynamic story discovery.

This work adds to the literature in numerous significant ways. Theoretically, it broadens our understanding of user involvement by combining aesthetic experience and immersive interactivity into a single conceptual

framework for AR comics. The study improves prior approaches that primarily focus on technology functionality by identifying aesthetic experience as a fundamental mechanism linking immersive technologies to engagement outcomes. Methodologically, the study combines information from various AR application areas to provide transferable insights for AR comic research, resulting in a more comprehensive knowledge of engagement processes across immersive media settings. Practically speaking, the findings are useful for comic creators, digital publishers, visual communication designers, educators, and creative sectors looking to create AR comic experiences that encourage deeper involvement through captivating aesthetics and interactive storytelling. Finally, the study adds to the growing discussion about immersive media by demonstrating that successful AR comic experiences rely not only on technological innovation, but also on the development of meaningful aesthetic and narrative experiences that actively engage users in the storytelling process (Abbasi et al., 2024; Mcfettridge & Iqbal, 2024; Shafana & Silpasuwanchai, 2024; Yuan, 2026).

LITERATURE REVIEW SURVEY METHOD

A systematic and structured strategy was used to perform a thorough literature assessment of investigate how aesthetic experience and immersive interaction influence user engagement in Augmented Reality (AR) comics. Guided by the research question, *"How do aesthetic experience and immersive interaction influence user engagement in augmented reality comics?"*, the review followed a rigorous, transparent, and replicable process for identifying, screening, and synthesising relevant scholarly literature.

The Scopus database, which is known for its academic reliability and extensive coverage, was used to conduct the initial search. The review focused on peer-reviewed journal articles published between 2020 and 2026 to ensure that the most recent innovations and scholarly conversation were included in this ever-changing field. A total of 900 pages were initially obtained using the search string: TITLE-ABS-KEY ("Augmented Reality" OR "AR") AND ("Comic*" OR "Digital Comic*" OR "Interactive Comic*" OR "Narrative Media" OR "Digital Storytelling" OR "Interactive Storytelling") with a filter used to limit results to English language journals. This initial pool was then narrowed down to 120 articles related to the scope based on keyword presence and abstract alignment.

Studies were excluded if they did not explicitly address augmented reality environments, immersive interaction, aesthetic experience, user engagement, or narrative participation. Publications focusing primarily on technical system development without user-centred outcomes, non-AR technologies, conference proceedings, review papers, book chapters, editorials, and non-English publications were also excluded.

After applying the predefined inclusion and exclusion criteria, a final corpus of 37 peer-reviewed journal articles was retained for in-depth qualitative analysis. These studies represented a diverse range of application contexts, including education, cultural heritage, tourism, museums, gaming, journalism, and digital media, providing a comprehensive perspective on engagement within immersive environments. A thematic synthesis approach was subsequently employed to identify recurring concepts, theoretical perspectives, and empirical findings across the selected studies. The analysis revealed three dominant themes: Immersive Engagement, which focuses on cognitive, emotional, and behavioural involvement within AR environments; Aesthetic Experience, which encompasses visual appeal, sensory immersion, emotional resonance, and spatial visualisation; and Interactive Storytelling, which examines narrative immersion, user agency, and participatory content exploration.

By integrating findings across multiple disciplinary contexts, this review develops a comprehensive understanding of the mechanisms through which AR technologies transform passive content consumption into active and meaningful experiences. The resulting synthesis contributes to the growing body of immersive media research by highlighting the interrelationships among immersive interaction, aesthetic experience, and user engagement, while offering theoretical and practical insights for the design and development of future AR comic experiences.

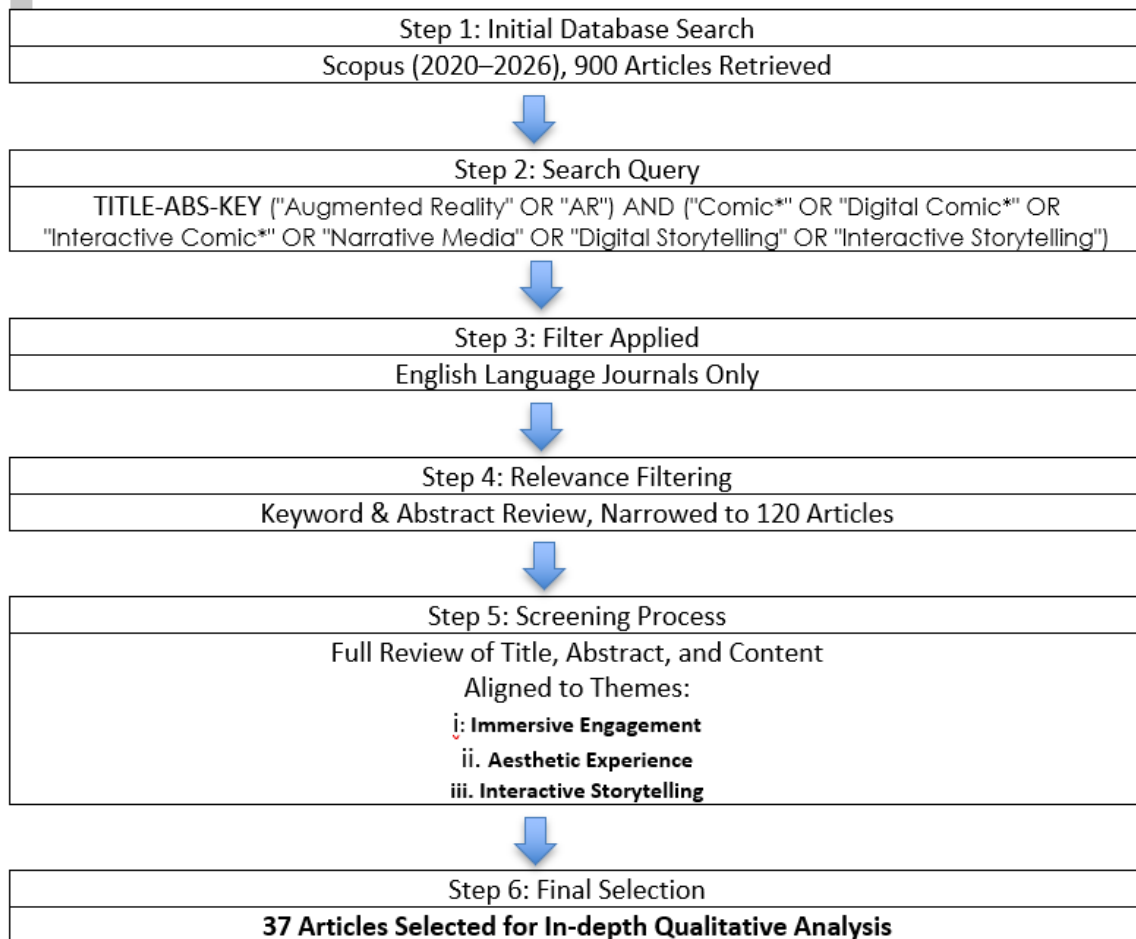


Fig. 2. Flow diagram for Literature Survey Method

Research Objective	Supporting Theme	Number of Studies
Examine immersive interaction in AR environments	Immersive Engagement	16
Investigate aesthetic factors influencing user experience	Aesthetic Experience	9
Explore narrative mechanisms enhancing engagement	Interactive Storytelling	12
Understand user engagement in AR comics	Integrated Framework	37

Table 1: Mapping Connection of Findings to Research Question

Table 1 shows the connection between the research objectives and topic findings from the systematic literature review. The distribution of research over the three categories shows that user engagement in Augmented Reality (AR) environments is a multidimensional phenomenon shaped by the interplay of immersive technologies, aesthetic features, and narrative experiences. The issue of Immersive Engagement garnered the most attention, with 16 studies emphasising the role of interactivity, presence, participation, and sensory immersion in increasing users' cognitive, emotional, and behavioural involvement. These findings imply that immersive interaction is a key strategy for capturing user attention and maintaining engagement in AR environments. The predominance of this theme indicates a growing research interest in understanding how technology affordances such as real-time interaction, spatial immersion, and multimodal experiences contribute to meaningful user engagement. Meanwhile, 12 research focused on interactive storytelling, emphasising the relevance of narrative immersion, user agency, and participatory content exploration. These findings indicate that storytelling acts as a link between technical interaction and emotional engagement, allowing users to actively generate meaning through narrative experiences. The incorporation of storytelling components into AR settings changes users

from passive observers to active participants in the communication process. Overall, the data suggest that immersive interaction, aesthetic experience, and interactive storytelling work together to increase user engagement. This theme integration clearly addresses the research question by demonstrating how immersive technologies, attractive visual aesthetics, and meaningful narrative experiences improve engagement in AR comics. The synthesis thus encourages the creation of an integrated conceptual framework in which immersive interaction influences aesthetic experience and storytelling engagement, ultimately enhancing total user engagement.

RESULTS

Immersive Engagement

The reviewed literature synthesis indicates that immersive engagement is the primary mechanism through which Augmented Reality (AR) environments influence user experiences. Engagement is defined in all studies as a multidimensional construct comprising cognitive, emotional, behavioural and experiential involvement. However, scholars generally agree that immersive technologies increase engagement, but they disagree significantly on how engagement is produced, measured, and maintained. These differences reveal significant theoretical and methodological tensions that are highly relevant to understanding user engagement in AR comics (Shafana & Silpasuwanchai, 2024). The literature collectively positions immersion as a key antecedent to engagement. Studies in cultural heritage, tourism, museum education, gaming and digital media have shown that interactive AR environments increase user participation due to a higher sense of presence and involvement (Dağ et al., 2024; M. Huang et al., 2025; H. Li et al., 2025; Wang, 2026). This leads to the understanding of engagement as happening when users go beyond the passive observation and actively interact with digital content embedded into physical environments. Wang (2026) contends that context-aware navigation systems improve behavioural, emotional, and cognitive engagement simultaneously. (Dağ et al., 2024) show that immersive experiences significantly affect user engagement, place satisfaction, and perceived authenticity in museum contexts. Similar results are reported by (M. Huang et al., 2025) who showed that mixed reality environments outperform conventional AR interfaces as the deeper immersion allows stronger engagement and learning outcomes. Taken together, this body of work suggests that immersion acts as an engagement catalyst by reducing the psychological distance between users and digital content.

Despite this convergence, scholars theorise engagement through different lenses. Several studies are based on technological perspectives, identifying interactivity, presence, usability, and system functionality as the main engagement drivers (Lee et al., 2023; Ngo et al., 2025; T. Wu & Liu, 2025). Engagement is often seen in this tradition as a product of the technological affordances that enable users to manipulate, explore and experience virtual content. But research drawing on experiential and narrative perspectives suggests that engagement cannot be explained by technological functionality alone (H. Li et al., 2025; O'Meara & Szita, 2021; Tang & Zhang, 2025). They discovered that when immersive technologies were integrated with meaningful narrative experiences and opportunities for personal interpretation, users showed higher levels of engagement. Whereas research orientated towards technology has focused on the performance of the system and the design of interaction, research orientated towards narratives has emphasised emotional investment and experiential participation as equally important determinants of engagement. This divergence implies that immersive engagement is not simply a technological effect, but a psychological and social construction.

Another significant aspect of convergence is the importance of interactivity. Throughout the reviewed literature, interactive participation is consistently identified as a significant contributor to engagement. Studies on tangible interaction systems (Yu et al., 2024), gesture-controlled interfaces (Apopei, 2025; Messaci et al., 2022), hybrid AR-VR environments (Y. Li et al., 2023), and adaptive visual systems (T. Wu & Liu, 2025) all show that allowing users to actively manipulate content boosts engagement. However, the results aren't fully consistent. Shafana and (Shafana & Silpasuwanchai, 2024) found that certain interaction modalities influenced user competence and tiredness but had no effect on engagement. Similarly, (Ngo et al., 2025) discovered that involvement increased user enjoyment while without immediately improving perceived utility. These paradoxes

demonstrate that interaction does not always result in engagement. Rather, the effectiveness of interactivity depends on how users perceive the meaningfulness, relevance, and experiential value of their interactions. Such findings call into question the naïve notion that increasing technology involvement always leads to increased engagement. Methodological discrepancies also contribute to disparities in results. Researchers typically use surveys, structural equation modelling (SEM), experiments, and user experience scales to assess engagement outcomes (Dağ et al., 2024; Ngo et al., 2025; Wang, 2026). These methods give useful statistical data on the relationships between immersion and engagement, but they frequently restrict engagement to measurable factors like satisfaction, enjoyment, or intent to use. In contrast, qualitative and mixed-methods research provide more in-depth insights into how consumers understand and experience immersive settings. (Mundhenke, 2020) emphasises the subjective nature of participation in immersive storytelling experiences, whereas (MacQuarrie & Steed, 2020) demonstrate that emotional connection, authenticity, and narrative quality have a substantial impact on user engagement beyond technological factors. Mixed-methods approaches adopted by X. Huang et al., (2025) and Widjaja et al., (2025) further demonstrate that engagement is influenced by both measurable behavioral outcomes and subjective experiential perceptions. Consequently, methodological choices have a considerable influence on how involvement is conceptualised and perceived in the literature.

Theoretical frameworks used in the studies also reveal significant limitations. Self-Determination Theory, User Experience Theory, Technology Acceptance Models, Presence Theory, and Immersive Learning frameworks are frequently used to explain engagement outcomes (Dağ et al., 2024; M. Huang et al., 2025; Srdanović et al., 2025). Although these theories efficiently explain motivation, involvement, and technical acceptability, they frequently miss aesthetic and narrative qualities, which may be especially significant in AR comics. Most frameworks view engagement as primarily a response to technological immersion, underestimating the importance of visual aesthetics, artistic expression, and storytelling structures. As a result, current theoretical approaches only offer a partial explanation for involvement in visually driven story settings. Several gaps emerge from this synthesis. First, the majority of research focuses on museums, tourism, education, gaming, cultural heritage, and e-commerce, with very little attention paid to AR comics. Second, participation is typically analysed as a direct result of immersive technology, whereas the intermediary role of aesthetic experience is understudied. Third, most studies look at individual aspects of engagement rather than how immersive interaction, visual aesthetics, and narrative participation work together. As a result, present research remains fragmented and insufficient to explain participation in AR comic contexts, where visual storytelling, artistic design, and interactive technologies are inextricably linked (Wang, 2026)

These inadequacies highlight the importance of the present investigation. Unlike earlier research, which has treated immersion as exclusively technological, this review contends that immersive engagement in AR comics should be viewed as a multidimensional process moulded by the interaction of immersive technology, aesthetic experiences, and narrative participation. By synthesizing evidence across diverse AR contexts, the study extends existing engagement theories beyond technological determinism and positions aesthetic experience as a critical mechanism through which immersive interaction influences user engagement. This viewpoint provides a more comprehensive understanding of engagement and adds a unique conceptual contribution to the emerging field of Augmented Reality comics (Liamruk et al., 2025)

Aesthetic Experience

While immersive engagement explains how users become interested in Augmented Reality (AR) environments, research indicates that involvement alone cannot fully account for the quality and depth of user experiences. Across the studies reviewed, aesthetic experience is identified as an important but frequently under-theorized component that influences how users perceive, understand, and emotionally respond to immersive information. Rather than serving solely as a visual attribute, aesthetic experience is viewed as a multifaceted phenomenon that includes visual appeal, sensory stimulation, emotional resonance, creative appreciation, and experiential meaning-making. The research suggests that aesthetic experience serves as an important link between technological contact and meaningful engagement, but there is significant heterogeneity in how scientists define, quantify, and explain its impact (X. Huang et al., 2025; Y. Li et al., 2023; Tella et al., 2025).

A dominant stance in the literature views aesthetic experience as the result of visual quality and sensory immersion. Studies on spatial AR environments, virtual exhibitions, digital museums, and immersive media commonly link aesthetic experience to realism, visual fidelity, spatial responsiveness, and environmental coherence (Abbasi et al., 2024; Y. Wu & Liu, 2025; Yuan, 2026). According to this viewpoint, users are more likely to enjoy and engage when digital content is visually appealing and seamlessly integrated with physical environments. Yuan (2026), for example, shows that immersive visual communication frameworks that combine AR, VR, and advanced 3D visualisation improve spatial perception and increase engagement length. Similarly, Abbasi et al. (2024) contend that visual clarity and chromatic consistency strongly influence user pleasure and comfort in immersive situations. These studies jointly position aesthetics as an experiential outcome produced by technology sophistication and visual optimisation. However, a different body of research expands aesthetic experience beyond visual appearance to include emotional and symbolic dimensions. Studies on augmented reality art installations, cultural heritage applications, museum exhibitions, and interactive media argue that aesthetic experiences emerge through users' emotional and interpretive interactions with content rather than visual realism alone (O'Meara & Szita, 2021; Vijay et al., 2025; Y. Wu & Liu, 2025). According to this viewpoint, aesthetics is more than just visual appeal; it also includes the production of emotional resonance, personal significance, and sensory engagement. While technologically orientated research focus on visual performance and perceptual quality, experiential perspectives show that users gain aesthetic value from the way immersive settings elicit emotions, memories, and cultural connections. This disparity implies that aesthetic experience is both a perceptual and interpretive process, which challenges reductionist approaches that associate aesthetics exclusively with visual design excellence (Singh, 2025)

The literature also demonstrates significant disparities in the theoretical frameworks employed to describe aesthetic sensations. Many research rely implicitly on user experience (UX) frameworks and human-computer interaction theories, with usability, pleasure, and enjoyment cited as indications of favourable aesthetic outcomes (M. Huang et al., 2025; Mcfettridge & Iqbal, 2024; Ngo et al., 2025). While these approaches offer measurable frameworks for assessing user responses, they frequently miss the artistic and communicative aspects of aesthetic experience. In contrast, studies based on visual communication, experiential learning, and aesthetic perception theories highlight the symbolic and emotional relevance of visual (O'Meara & Szita, 2021). Although these viewpoints provide greater conceptual insights, they are usually constrained by small sample sizes and qualitative methods. As a result, the literature remains divided between functionalist methods, which see aesthetics as a component of usability, and interpretive approaches, which see aesthetics as a type of experience meaning formation. Methodological differences also influence how aesthetic perception is understood. Quantitative studies often use quantitative constructs to define aesthetics, such as visual appeal, enjoyment, satisfaction, perceived quality, or emotional arousal (Dağ et al., 2024; M. Huang et al., 2025; Ngo et al., 2025). These approaches are useful for statistical testing and causal modelling, but they may oversimplify the subjective and contextual character of aesthetic experiences. In contrast, qualitative research focuses on subjective interpretations, emotional responses, and sensory experiences that are difficult to quantify (Mundhenke, 2020; O'Meara & Szita, 2021). Mixed-methods research provides a more complete understanding by combining behavioural measures with subjective reflections, indicating that aesthetic experiences include perceptual, emotional, and social events (Su et al., 2026; Widjaja et al., 2025). Thus, methodological choices have a substantial impact on how researchers conceptualise the relationship between aesthetics and engagement.

Despite the increasing awareness of aesthetics in immersive media research, numerous limitations remain. First, aesthetic perception is typically viewed as a secondary product rather than a primary explanatory mechanism. Most studies prioritise technical immersion and user involvement, with aesthetics serving as a supporting aspect. Second, previous research frequently focuses on museums, cultural heritage, education, and exhibition settings, leaving entertainment-oriented story media under-represented. Third, the majority of research look at aesthetic experience in isolation from storytelling processes, despite evidence that visual aesthetics and narrative engagement are inextricably linked. As a result, the literature gives a limited grasp of how aesthetic experiences influence participation in visually driven storytelling settings like AR comics. These disparities are especially pronounced because AR comics rely primarily on visual communication and artistic expression to convey storylines. Unlike educational or museum-based AR applications, AR comics demand users to interact with

visual elements as part of the storytelling experience. The current study tackles this restriction by emphasising aesthetic experience as a crucial mechanism through which immersive interaction influences user engagement. The study expands existing understandings of aesthetics beyond visual attractiveness by incorporating insights from visual communication, immersive media, and digital storytelling research, conceptualising it as a multidimensional process involving perception, emotion, interpretation, and participation. In doing so, the study makes a novel contribution to AR comic scholarship by emphasising the importance of aesthetic experience in translating technical interactions into meaningful and compelling narrative experiences (Shafana & Silpasuwanchai, 2024)

Interactive Storytelling

Among the studies examined, interactive storytelling appears as the main distinguishing feature of immersive media from traditional means of communication. While immersive engagement encourages involvement and aesthetic experience focuses on sensory and emotional enjoyment, interactive storytelling is concerned with how users generate meaning through narrative interaction. The research repeatedly shows that storytelling has a significant impact on engagement results, yet scholars have quite different ideas about narrative participation, user agency, and story immersion. These distinctions highlight critical theoretical and methodological issues that are especially pertinent to the creation of Augmented Reality (AR) comics. Overall, the analysed research indicate that storytelling improves engagement by converting users from passive recipients to active participants in narrative contexts. Research in cultural heritage, museum education, journalism, gaming, and digital media repeatedly shows that narrative structures promote user motivation, emotional involvement, and knowledge retention (X. Huang et al., 2025; H. Li et al., 2025; Yu et al., 2024). Unlike traditional storytelling forms in which audiences receive prefabricated narratives, augmented reality settings allow users to explore, manipulate, and affect story aspects through interactive involvement. As a result, engagement is directly tied to users' capacity to navigate and contribute to story experiences. Studies by H. Li et al., (2025) and (Tang & Zhang, (2025) show that narrative-based AR apps considerably improve motivation and user experience when compared to non-narrative designs, emphasising storytelling as a vital engagement strategy.

Despite widespread agreement on the importance of storytelling, scholars approach interactive tales in various ways. One line of research sees storytelling primarily as a cognitive framework that aids in learning, comprehension, and information retention. Narrative structures are used in educational and cultural heritage contexts to organise information and facilitate knowledge acquisition (Dogan Turkoglu & Cakıcı Alp, 2025; X. Huang et al., 2025; Q. Li et al., 2026). Storytelling, in this sense, boosts engagement by allowing people to consume and retain content more efficiently. In contrast, another line of research views storytelling as an experiential and emotional activity. O'Meara & Szita, (2021), (Mundhenke, (2020), and (M. Huang et al., 2025) show that narratives foster emotional connections, empathy, and personal involvement in ways that go beyond informational learning. Cognitive approaches prioritise knowledge transfer, whereas experiential perspectives emphasise emotional absorption and subjective interpretation. This discrepancy shows that interactive storytelling serves many tasks at once, acting as both a cognitive structure and an emotional experience.

User agency is another much debated topic. According to several research, giving users more influence over narrative advancement and content exploration boosts engagement (H. Li et al., 2025; Tang & Zhang, 2025; Yu et al., 2024). These studies suggest that opportunities for customization, interaction, and exploration strengthen users' sense of ownership and participation. However, other research suggests that too much freedom might impair narrative coherence and reduce the effectiveness of storytelling experiences (MacQuarrie & Steed, 2020; Mundhenke, 2020). While greater agency encourages engagement, it can also result in fragmented narrative experiences that reduce emotional investment. This tension underscores an important difficulty in immersive storytelling design: balancing user agency with narrative structure. The contradiction is especially relevant in AR comics, where readers expect both narrative continuity and opportunities for interaction.

Methodological approaches also influence perceptions of storytelling efficacy. Quantitative studies typically evaluate storytelling using engagement measures, learning outcomes, motivation ratings, and behavioural indicators (H. Li et al., 2025). These methodologies show significant benefits associated with narrative-based

designs, but they frequently fail to capture the complexities of users' interpretive experiences. In contrast, qualitative research reveals how users negotiate meaning, form emotional connections, and create narrative worlds (Mundhenke, 2020; O'Meara & Szita, 2021). Mixed-methods research offers a more balanced approach by combining objective engagement measurements with subjective narrative experiences, indicating that storytelling efficacy is determined by both structural design and personal interpretation (X. Huang et al., 2025; Widjaja et al., 2025). As a result, methodological diversity helps to provide a more nuanced knowledge of storytelling while simultaneously making it difficult to build unified theoretical explanations. Theoretical frameworks employed in the literature have comparable limitations. The narrative transportation theory, presence theory, experiential learning theory, and interactive media frameworks are dominant in storytelling research. Although these theories accurately explain immersion, empathy, and narrative participation, they frequently overlook visual aesthetics as an important aspect of storytelling experiences. Most frameworks approach narratives as cognitive or emotional processes, ignoring the visual communication tactics used to experience stories in augmented reality environments. As a result, existing theories offer limited explanations for media formats like augmented reality comics, in which storytelling, aesthetics, and interaction are inextricably linked. Several crucial holes exist. First, storytelling research is primarily focused on museums, cultural heritage, education, and journalism, with little attention paid to comic-based narrative media. Second, despite the fact that immersive storytelling is intrinsically visual, prior research usually analyse narrative involvement separately from aesthetic experience. Third, there is minimal study on how storytelling, visual aesthetics, and immersive interaction combine to influence engagement. As a result, the research lacks a comprehensive paradigm for explaining involvement with AR comics (Aloudat et al., 2025; Marinescu & Iordache, 2023).

The current study tackles these issues by emphasising interactive storytelling as a key component of a larger engagement paradigm that includes aesthetic experience and immersive involvement. Rather than addressing storytelling as a separate variable, the study conceptualizes narrative participation as an interrelated process through which users perceive visual aesthetics and engage with immersive technologies. This viewpoint broadens current storytelling theories by acknowledging that engagement with AR comics results from the simultaneous interaction of narrative immersion, visual communication, and technical participation. As a result, the study makes a unique contribution to the growing field of AR storytelling by providing a more comprehensive understanding of how immersive interaction and aesthetic experience shape user engagement in augmented reality comics. (Abbasi et al., 2024)

To answer the research question, "How do aesthetic experience and immersive interaction influence user engagement in augmented reality comics?" the selected studies were grouped into three themes: immersive engagement, aesthetic experience, and interactive storytelling. Table 6 summarises the thematic synthesis and highlights the key observations emanating from the literature. Rather than operating as separate dimensions, these themes explain how AR experiences convert passive content consumption into active, emotionally meaningful, and participatory engagement. The synthesis demonstrates that immersive technologies serve as the interactional base, aesthetic experiences impact emotional and sensory reactions, and interactive storytelling promotes narrative involvement. These factors form the conceptual foundation for understanding user involvement in AR comic contexts.

Table 6: Synthesising Themes on Enhancing User Engagement Through Aesthetic Experience in Augmented Reality Comics

Theme	Key Insights from Studies	Critical Synthesis
Immersive Engagement	Wang (2026), P.K. et al. (2024), Tella et al. (2025), Huang et al. (2024), Li et al. (2023), Pagliari et al. (2025), Bryant & Hemsley (2022), Apopei (2025), Singh (2025), Marinescu & Iordache (2023), Aloudat et al. (2023), Shafana & Silpasuwanchai (2023), Dağ et al. (2023), Wu & Liu (2024), Messaci et al. (2021), Lee et al. (2023).	Immersive engagement is consistently conceptualised as a multidimensional construct encompassing cognitive, emotional, and behavioural participation. Collectively, the studies demonstrate that AR environments enhance engagement through presence, interactivity, context awareness, multimodal interaction, and real-time participation. However, findings also reveal that technological immersion alone does not guarantee engagement. While many studies emphasise usability and interaction design as primary engagement drivers, others show that excessive complexity, fatigue, or poor interaction design may reduce user involvement. Thus, engagement emerges not merely from technological sophistication but from meaningful interactions that connect users emotionally and experientially with digital content.
Aesthetic Experience	Liamruk et al. (2025), Wu & Liu (2025), Su et al. (2026), Ngo et al. (2025), Yuan (2026), Abbasi et al. (2024), Vijay et al. (2025), Cortes et al. (2024), MacQuarrie & Steed (2020), Ruiiu et al. (2024), Lee et al. (2023).	Aesthetic experience extends beyond visual attractiveness to encompass emotional resonance, sensory immersion, spatial perception, and artistic appreciation. Collectively, these studies suggest that visual fidelity, colour consistency, environmental realism, and multimodal communication significantly influence users' enjoyment, satisfaction, and emotional attachment. Nevertheless, scholars differ in their conceptualisation of aesthetics. Technology-oriented studies emphasise visual clarity and realism, whereas experiential perspectives highlight symbolic meaning and emotional interpretation. This divergence indicates that aesthetics functions simultaneously as a perceptual and interpretive process. Consequently, aesthetic experience acts as a mediating mechanism that transforms technological interaction into meaningful engagement.
Interactive Storytelling	Srdanović et al. (2024), Yu et al. (2024), Li et al. (2025), Mundhenke (2020), O'Meara & Szita (2023), Tang & Zhang (2024), Widjaja et al. (2025), Li et al. (2025), Dogan Turkoglu & Alp (2025), Mcfettridge & Iqbal (2024), Huang et al. (2024), Huang et al. (2024).	Interactive storytelling emerges as the mechanism through which users actively construct narrative meaning within immersive environments. The studies collectively demonstrate that narrative exploration, user agency, emotional involvement, and participatory experiences enhance engagement beyond conventional content consumption. However, contradictions exist regarding the degree of user control. While some scholars argue that greater narrative freedom strengthens engagement, others suggest that excessive autonomy may disrupt narrative coherence and reduce emotional impact. Therefore, effective storytelling requires a balance between structured narrative guidance and interactive participation. In AR comics, storytelling becomes particularly significant because narrative progression is inseparable from visual interaction and aesthetic experience.

Table 6 depicts user engagement in AR environments as the result of a dynamic interaction between immersive participation, aesthetic appreciation, and narrative involvement. While immersive involvement helps users form cognitive and behavioural connections with digital content, aesthetic experience improves emotional attachment and sensory satisfaction. Interactive storytelling enhances user engagement by allowing them to actively participate in narrative building. As a result, the synthesis shows that AR comics represent a unique convergence of these three dimensions, in which engagement occurs from the integration of visual aesthetics, immersive interactivity, and participatory storytelling rather than just from technology. This conclusion serves as the conceptual underpinning for the suggested framework of Immersive Interaction → Aesthetic Experience → User Engagement.

DISCUSSION

This systematic literature analysis attempted to answer the following research question: How do aesthetic experience and immersive interactivity affect user engagement in augmented reality (AR) comics? A meta-analysis of 37 studies found that user involvement in AR environments is formed by the dynamic interaction of three interconnected dimensions: immersive engagement, aesthetic experience, and interactive storytelling. Instead of functioning independently, these dimensions work together to transform passive content consumption into active, emotionally meaningful, and participatory experiences. According to the research, engagement in AR comics is the result of a complex link between immersive interactivity, visual aesthetics, and narrative participation, rather than just technological innovation. The data reveal that immersive interaction is the primary method that initiates user involvement. Across a wide range of contexts, including museums, cultural heritage, tourism, gaming, journalism, and education, immersive technology consistently improved users' cognitive, emotional, and behavioural engagement. This finding is consistent with earlier research emphasising the role of presence, interactivity, and experiential immersion in increasing engagement. However, the synthesis builds on previous research by finding that immersion alone is insufficient to sustain meaningful involvement. While technology-centered studies usually focus on interactivity as the key driver of engagement, the examined research reveals that users remain interested only when interactions are evaluated as meaningful, purposeful, and emotionally satisfying. This finding contributes to immersive media research by demonstrating that engagement is mediated by users' subjective experiences rather than technological affordances alone.

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Interactive storytelling appeared as the third important factor impacting engagement. Consistent with narrative transportation and immersive storytelling research, the examined studies show that engagement rises when users actively participate in narrative production rather than simply receiving information. However, the findings highlight a tension in the existing literature surrounding user agency. While many studies claim that increased interactivity improves narrative engagement, others believe that too much freedom might undermine narrative coherence and lessen emotional effect. This seeming inconsistency does not indicate a flaw in the literature, but rather emphasises the complexities of immersive storytelling design. The findings indicate that effective engagement necessitates a balance of story structure and user liberty. For AR comics, this means that readers should be given opportunities for interaction and exploration while yet receiving adequate narrative guidance to ensure plot continuity and emotional engagement. From a theoretical standpoint, the findings add to various areas of literature. First, the study contributes to engagement theory by showing that user involvement in immersive environments is a complex process influenced by technological, aesthetic, and narrative variables. Existing frameworks usually prioritise either technological affordances or psychological consequences, resulting in fragmented explanations for involvement. The current synthesis presents a more integrated perspective in which immersive interaction enhances aesthetic experience, hence improving narrative involvement and engagement outcomes. Second, the findings improve current understandings of aesthetic experience by emphasising aesthetics as an active mechanism that influences interpretation, emotion, and engagement rather than just visual appeal. Third, the review contributes to the field of interactive storytelling by demonstrating that narrative engagement in augmented reality is inextricably linked to visual communication and sensory experiences. These contributions help to build a more comprehensive framework for understanding involvement with AR comics and other immersive story media (X. Huang et al., 2025; P.K et al., 2025; Wang, 2026)

The discoveries have substantial practical ramifications. The review argues that effective AR comics prioritise immersive engagement, attractive visual aesthetics, and meaningful storytelling above focusing only on technological characteristics. Designers should create visually cohesive spaces that encourage emotional engagement while also providing intuitive interaction mechanisms that enhance, rather than detract from, the narrative experience. Educators and learning designers may also benefit from adding AR comics into instructional settings, since immersive storytelling and visual experiences have been demonstrated to boost motivation, attention, and knowledge retention. Furthermore, creative industries and media producers can apply these insights to create more compelling that combine technology innovation and artistic communication (Singh, 2025; Su et al., 2026). Several findings from the evaluated research appeared to be conflicting. For example, while interaction was consistently linked to increased engagement, several research found limited or inconsistent results. Similarly, greater story freedom was associated with increased engagement, but it also degraded narrative coherence. These discrepancies could be explained by contextual differences between application areas, user populations, and technical implementations. Engagement is likely driven not only by the appearance of interactive features, but also by their quality, relevance, and integration into larger experiential contexts. As a result, inconsistent findings should be understood as indicators of contextual complexity rather than theoretical disagreement (Bryant & Hemsley, 2024; Ruiu et al., 2024)

Despite its merits, this review has certain shortcomings. The study used only peer-reviewed journal articles indexed in Scopus and ERIC that published in English between 2020 and 2026. As a result, relevant studies from other databases, languages, or publication formats may have been eliminated. Furthermore, the synthesis concentrated on AR-related research rather than empirical studies directly studying AR comics, reflecting the field's nascent character. Furthermore, the thematic analysis was restricted to the conceptual information contained in published studies and did not include actual empirical validation of the claimed links. Future research should address these constraints through empirical experiments in AR comic contexts. Quantitative studies might look at how aesthetic experience mediates the relationship between immersive interaction and user engagement, whilst qualitative study could look at how readers interpret and emotionally respond to AR comic narratives. Comparative research of conventional comics, digital comics, and AR comics would also shed light on the distinctive contributions of immersive technologies. Finally, future study should look into distinct user communities, cultural contexts, and age groupings to see if engagement mechanisms change across audiences.

These investigations would help to build a more thorough theoretical framework for understanding engagement in immersive visual storytelling settings.

Overall, the data indicate that user interest in AR comics stems from the convergence of immersive interactivity, aesthetic pleasure, and interactive storytelling. This integrated perspective enriches current understandings of immersive media and lays the groundwork for future research and design techniques within the rapidly growing field of augmented reality storytelling.

CONCLUSION

This study aimed to investigate how aesthetic experience and immersive interactivity affect user engagement in Augmented Reality (AR) comics by synthesising current research in immersive media, visual communication, user experience, and interactive storytelling. Rather than viewing engagement as a direct result of technological innovation, the study sought to understand the underlying mechanisms by which AR environments shift users from passive consumers of content to active participants in narrative experiences. The study, which is based on a systematic assessment of 37 studies, gives a more integrated knowledge of how technological, aesthetic, and narrative elements impact participation in developing forms of digital storytelling. The findings suggest that user engagement with AR comics is best understood as a multifaceted and sequential process. Immersive interaction creates the circumstances for participation by encouraging presence, interactivity, and experience engagement. However, technology immersion alone cannot fully explain why consumers remain engaged. Instead, aesthetic experience emerges as a crucial interpretive layer that converts contact into emotional, sensual, and perceptual significance. This process is further deepened by interactive storytelling, which allows users to participate in narrative production, resulting in chances for agency, exploration, and meaning-making. Collectively, these findings indicate that engagement is achieved not alone through technology functionality, but also through the convergence of immersive experiences, aesthetic appreciation, and narrative participation.

The practical implications of these discoveries go beyond the realm of AR comics. For designers, developers, publishers, and creative sectors, the study shows that technological expertise alone cannot lead to meaningful interaction. Effective AR experiences necessitate the precise combination of visual aesthetics, sensory richness, and participatory storytelling tactics that build emotional connection and narrative engagement. For educators and learning designers, the findings underscore AR-based storytelling environments' ability to improve motivation, attention, and experiential learning. More broadly, the report provides recommendations for growing digital media industries looking to create user-centred experiences that balance innovation with meaningful communication and participation. Beyond its immediate applicability, the study adds to larger discussions about the future of immersive media and digital communication. The findings call into question long-held beliefs that technological innovation always results in better user experiences. Instead, they argue that the value of immersive technologies comes in their ability to promote more complex kinds of perception, interpretation, and participation. This viewpoint advocates a move away from considering technology as an end in itself and toward seeing it as a medium for creating significant aesthetic and narrative experiences. As a result, the study broadens current understandings of involvement and provides a conceptual framework that can be used to a variety of immersive communication scenarios.

When interpreting the findings, it is important to recognise some limitations. The review focuses solely on peer-reviewed journal articles published in English, with an emphasis on AR-related contexts rather than empirical investigations dedicated directly to AR comics. As an emerging subject, AR comic research is still limited, necessitating the synthesis of knowledge from neighbouring domains such as cultural heritage, education, tourism, gaming, and immersive media. These constraints do not decrease the significance of the findings; rather, they define the context within which the conclusions should be viewed. Future study should empirically evaluate the suggested paradigm in AR comic contexts and investigate the mediating interactions described in this paper. Longitudinal research could look into how aesthetic experiences affect long-term involvement, whilst comparative studies could compare conventional comics, digital comics, and augmented reality comics. To improve understanding of engagement mechanisms within immersive narrative media, more study should be

conducted across varied cultural contexts, demographic groupings, and new technologies such as artificial intelligence, adaptive storytelling systems, and mixed-reality environments. Finally, our study reveals that the future of AR comics resides not in technological novelty, but in their ability to create meaningful experiences that combine interaction, aesthetics, and storytelling. As immersive technologies continue to transform the landscape of digital communication, understanding how these aspects interact will become increasingly crucial in both academia and practice. The paradigm proposed in this study serves as the foundation for this developing conversation, paving the way for more engaging, human-centered, and narratively rich immersive experiences.

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