



Designing Narrative-Driven Immersive Experiences: From Visual Communication's Narrative Framework to Interactive Participatory Creation

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Abstract. This study examines the transformative landscape of visual communication design in the digital age, focusing on narrative-driven immersive experience design supported by digital technologies such as VR and AR. The research develops a tripartite theoretical model encompassing “Visual Communication Narrative Framework—Digital Media Technology Support—Interactive Participatory Creation.” It analyzes the narrative essence of visual communication, the composition of its framework, and the design dimensions of immersive experiences. Furthermore, it proposes coding strategies for visual communication narrative frameworks, hierarchical spatial design approaches, and digital media-driven interactive participatory creation methodologies. Concurrently, the study identifies ethical and user experience challenges in immersive experience design, including sensory overload, narrative hegemony, and data privacy. It advocates for a future paradigm shift in immersive experience design from mere “experience” to “symbiosis,” emphasizing the need to balance technological innovation with user experience and cultivate an open, pluralistic narrative ecosystem.

Keywords: Immersive experience design; visual communication; narrative framework; digital media technology; interactive participatory creation; metaverse; sustainable narrative

1 Introduction

1.1 Research Background and Real-World Impetus

In the current digital epoch, the revolution in digital technology is reshaping the landscape of visual communication design with unprecedented momentum. The paradigm has shifted from early, static information dissemination models to a progressive evolution towards dynamic, interactive narrative construction[1]. Immersive experience design has emerged as a pivotal vehicle, crucial for bridging the emotional connection between users and brand value. Throughout this transformation, the proliferation of cutting-edge technologies such as virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) has played a paramount role. These advancements continually expand the narrative horizons of visual communication, affording designers a more

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expansive creative canvas while simultaneously empowering users with novel participatory roles.

Taking Virtual Reality (VR) technology as a prime example, it facilitates the creation of hyperrealistic virtual environments, immersing users so profoundly they feel physically present, directly experiencing the narrative unfold. Users transition from passive information consumers to active participants in the storytelling process, their choices and actions dynamically shaping the plot's trajectory[1]. This inherent interactivity significantly amplifies user immersion and engagement. Similarly, Augmented Reality (AR) technology, by seamlessly overlaying virtual information onto the real world, offers users novel visual experiences, transcending the limitations of traditional two-dimensional planes and rendering narratives more three-dimensional and vibrant. Furthermore, Artificial Intelligence (AI) technology, leveraging its robust data analysis and intelligent interaction capabilities, can curate personalized narrative content and experiences based on user behavior and preferences, thereby deepening the symbiotic relationship between the user and the work. (Figure 1)

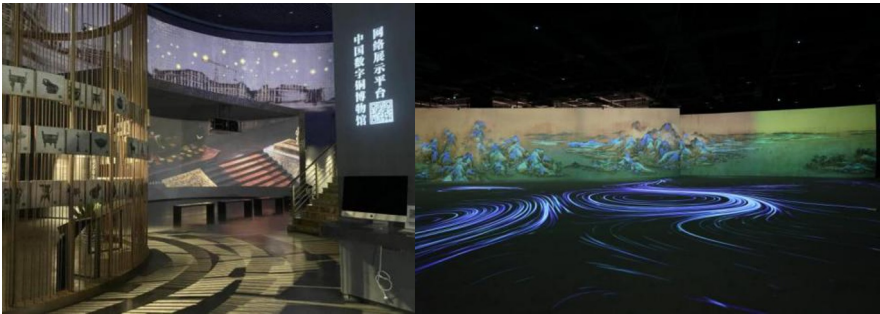


Fig. 1. The China Digital Bronze Museum Network Exhibition Platform

1.2 Research Objectives and Academic Value, Research Framework

This study aims to construct a three-dimensional theoretical model encompassing “Visual Communication Narrative Framework—Digital Media Technology Support—Interactive Participatory Creation”, as depicted in Table 1 and Figure 2. This framework seeks to deeply elucidate the information organization mechanisms and emotional transmission pathways of narrative logic within immersive experiences[2].

The first section, the Visual Communication Narrative Framework, will delve into how visual elements construct a coherent and captivating story world from a narratological perspective. It will explore the application and effects of various narrative structures (e.g., linear, non-linear) in immersive experience design. The core objective is to deconstruct the narrative functions of visual elements through a narratological lens, clarifying the appropriate scenarios and experiential goals for different narrative structures.

The second section, Digital Media Technology Support, will comprehensively examine how core technologies such as 3D modeling, dynamic interaction, and multi-

modal perception provide technical assurance for immersive experiences. It will analyze the application scenarios, mechanisms of action, and core objectives of these technologies to achieve precise alignment between technical capabilities and narrative requirements, thereby creating rich and realistic narrative effects[3].

The third section, Interactive Participatory Creation, will focus on the user's role and modes of participation within the narrative process. It will investigate the design of reasonable and engaging interactive mechanisms to stimulate users' proactive involvement, ultimately achieving the core value of enhancing user experience and satisfaction.

Table 1. Core Dimensions, Content and Objectives of Narrative-Driven Immersive Experience Design

Dimension	Core content	Key objectives
Visual Communication Narrative Framework	Analysis from a narratology perspective, construction of visual elements, and application of narrative structures such as linear and non-linear.	To construct a cohesive and compelling narrative world, it is essential to reinforce the logical consistency and emotional resonance of the storyline.
Digital media technology support	3D modeling, dynamic interaction, and multimodal perception technologies	Providing robust support for immersive experience technologies, we achieve rich and realistic narrative effects.
Interactive participatory creation	User Role Definition, Interaction Mechanism Design, and Behavioral Feedback Optimization	To foster proactive engagement, we aim to enhance experiential immersion and overall satisfaction through personalized narrative delivery.

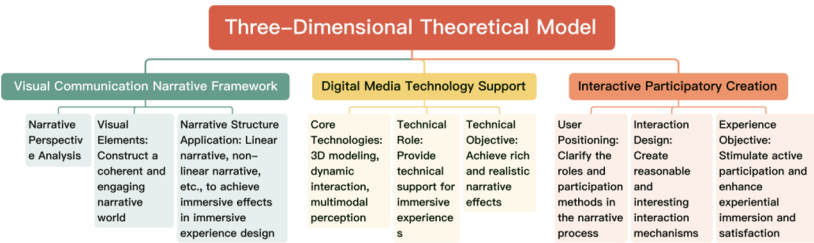


Fig. 2. Three-Dimensional Theoretical Model

2 Theoretical Foundations: The Paradigm Coupling of Visual Communication Narrative Frameworks and Immersive Experience

2.1 The Narrative Essence and Framework Construction of Visual Communication

Visual Translation of Narrative Strategies.

The essence of visual communication design lies in transforming abstract narrative content into intuitive visual symbols through elements like graphics, color, and motion

graphics[4]. Within this process, the visual translation of narrative strategies is paramount for constructing effective storytelling[4]. Taking graphic elements as an instance, concise and clear icons in interface design can rapidly convey information and guide user interaction. Consider, for example, the bottom navigation bar icons in WeChat; their simple graphic design, representing WeChat, Contacts, Discover, and Me respectively, allows users to effortlessly grasp their functions without textual explanations. These graphic elements form the foundation of the narrative communication between users and the application. In brand identity design, distinctive graphic symbols are crucial for embodying a brand's core values and cultural significance. The Apple logo, for instance, a subtly bitten apple, is both minimalist and profound, symbolizing not only innovation and technology but also conveying a brand spirit of daring to break boundaries and strive for excellence.

In visual communication, color stands as a highly expressive element, playing a pivotal role in narrative construction. Diverse palettes evoke distinct emotional associations, thereby shaping the audience's perception of the narrative content. Consider the film “Schindler's List” (Figure 3), which largely employs a monochromatic palette, establishing a somber and oppressive wartime atmosphere. The striking contrast of the young girl's red coat against this black-and-white backdrop serves as a potent symbol of hope for life and the enduring luminescence of humanity. This deliberate chromatic juxtaposition powerfully reinforces the film's narrative themes, leaving a profound impact on viewers. Furthermore, in the realm of dynamic visual design, camera movement and editing function as crucial instruments for controlling narrative pacing. The film “Inception” (Figure 4) masterfully utilizes rapid editing and intricate camera maneuvers, including dolly zooms and tracking shots, to craft a disorienting sense of intertwined dreamscapes and reality. This technique immerses the audience, guiding them through the protagonist's perspective across various dream strata, thereby amplifying the film's tension and suspense.



Fig. 3. “Schindler's List”

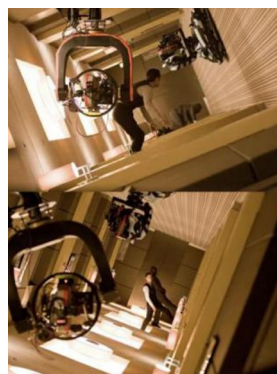


Fig. 4. “Inception”

Linear narrative, non-linear narrative, and metaphorical narrative are common storytelling methods in visual communication. Linear narratives unfold sequentially in chronological order, featuring clear causal relationships that are easily understood by

the audience. For instance, most advertisements employ a linear narrative approach, guiding viewers step-by-step from product introduction and feature display to showcasing usage effects, thereby fostering product understanding and stimulating purchasing desire. Non-linear narratives, on the other hand, transcend the limitations of time and space. Through multi-threaded and fragmented storytelling, they offer viewers a richer and more diverse narrative experience. A prime example is the film **Cloud Atlas**, which utilizes six seemingly independent yet interconnected stories spanning different times and spaces to illustrate the cyclical nature and inheritance of human destiny. Viewers must seek connections across various plotlines to piece together the complete narrative puzzle, a method that enhances the work's depth and intrigue. Metaphorical narratives, conversely, convey deeper meanings through symbolic representation, lending the storytelling a more subtle and nuanced quality[4]. In advertising design, flying birds are often used to symbolize freedom and dreams, while a sturdy castle might represent security and reliability. Through these metaphorical symbols, brand values and product characteristics are artfully communicated to consumers.

The Core Elements of Narrative Framing.

The narrative subject plays a pivotal role in immersive scenarios, with its identity construction directly influencing the user experience. Taking the first-person perspective as an example, in many immersive games, players enter the virtual world as the protagonist and drive the story's progression through their own actions and choices. For instance, in the "Tomb Raider" series, players control the protagonist, Lara Croft, personally experiencing various adventures, exploring mysterious ancient tombs, and battling enemies. This first-person perspective's sense of immersion makes players feel as if they are in the game world, enhancing emotional resonance and engagement. Role-playing is also a common method of narrative subject construction, where users experience different life stories by selecting various characters. For example, in some role-playing games, players can choose characters from different classes such as warrior, mage, or rogue, each with unique skills and background stories. Players engage in the game according to their preferences and strategies, enriching the narrative's diversity.

The integration of narrative space is a crucial characteristic of immersive experience design. Projection mapping, as one of the key technologies for merging physical and digital spaces, allows digital imagery to be projected onto the surfaces of physical environments, thereby enabling a narrative reconstruction of these spaces[5]. This technique is frequently employed in large-scale light shows and art exhibitions, where architectural structures, mountains, or other physical entities serve as projection canvases. Through dynamic light and shadow effects, historical narratives, cultural legends, or artistic works are brought to life. For instance, at the Avignon Festival in France, projection mapping has transformed ancient city walls into colossal canvases, orchestrating a breathtaking spectacle of light and shadow. Historical architecture and contemporary digital imagery interweave, offering audiences a novel visual experience that transports them through time, fostering a sense of convergence between history and modernity. The construction of digital spaces also unlocks boundless narrative potential. Virtual environments created by virtual reality (VR) and augmented reality (AR) technologies empower users with freedom of exploration and interaction. In the VR game "Half-

Life: Alex” (Figure 5), players are immersed in a science-fiction virtual world, interacting with objects in the environment via controllers to complete various missions. This immersive digital space provides players with a profoundly lifelike gaming experience.

Narrative time has also undergone a profound transformation in immersive experiences. The application of real-time interactive technologies has deconstructed linear time, allowing user actions to trigger plot branches and achieve non-linear temporality. In some interactive films, viewers can make choices at critical junctures, with different selections leading to divergent plot developments and endings. For instance, Netflix's interactive film “Black Mirror: Bandersnatch” (Figure 6) allows viewers to determine the protagonist's actions during playback, such as choosing breakfast or games. These decisions influence the protagonist's fate and the story's progression, transforming the audience from passive observers into co-creators of the narrative. This non-linear temporal storytelling significantly enhances viewer engagement and the overall experience.



Fig. 5. “Half-Life: Alex”



Fig. 6. “Black Mirror: Bodysnatcher”

2.2 Design Dimensions of Immersive Experience and Digital Media Empowerment

The Triple Characteristics of an Immersive Experience.

Sensory immersion forms the bedrock of the immersive experience. Multimodal perception technologies achieve a high degree of realism and presence by stimulating multiple senses, including vision, hearing, and touch. VR headsets, as critical devices for delivering immersive visual experiences, offer 360° visual coverage, transporting users into entirely new worlds. For instance, within VR travel applications, users can virtually explore renowned global landmarks like the Eiffel Tower in Paris or the Pyramids of Egypt. By turning their heads, they can appreciate the scenic beauty from all angles, simulating a truly present travel experience. Spatial audio technology further enhances immersion by adding a layer of auditory realism. It mimics the propagation character-

istics of sound in various spatial environments, providing users with precise sound localization and surround sound effects. In VR gaming, spatial audio allows users to clearly discern the approach of enemies from different directions, intensifying the game's tension and immersion.

Cognitive immersion emphasizes the logical consistency and emotional resonance of narrative content. Storyboard design, as an effective narrative tool, assists designers in structuring the narrative and guiding users in decoding clues. In filmmaking, storyboards serve as a crucial communication medium between directors and screenwriters, visualizing the plot through a series of sequential shots. They define aspects such as shot size, composition, and character actions for each scene, ensuring narrative coherence and logic. Within immersive experience design, storyboards similarly play a vital role. Through meticulously crafted storyboards, users are guided deeper into the narrative world, fostering an understanding of the story's background, character relationships, and plot progression, thereby eliciting emotional engagement.

Behavioral immersion encourages active user participation. Through interactive design and various techniques like gesture recognition and pressure-sensitive devices, user actions are translated into real-time system feedback. For instance, in some smart fitness equipment, pressure-sensing technology monitors the user's movement status and intensity in real-time, providing tailored guidance and recommendations based on performance. Users interact with the equipment by adjusting their movements to complete fitness tasks. This behavioral immersion not only enhances user engagement but also boosts interest and motivation in exercise. In virtual reality interactive art, users can naturally interact with virtual objects through gesture recognition—grabbing, moving, or transforming them—to create their own artwork. This shifts the user from a passive observer to an active creator, further deepening their sense of immersion and overall experience.

The Empowerment Pathways of Digital Media Technology.

Visualization narrative tools offer robust creative support for immersive experience design. Unity and Unreal Engine, as the leading game development engines, are widely utilized in immersive project development, enabling rapid generation of dynamic scenes and real-time rendering. In large-scale theme park immersive attractions, Unity Engine is employed to construct photorealistic virtual environments, integrating special effects, lighting, and other elements to deliver breathtaking visual experiences for visitors. Adobe After Effects, a professional motion graphics design software, is frequently used for building interactive prototypes[6]. Through its rich animation effects and compositing techniques, it organically combines various visual elements to produce exquisite dynamic visuals. In app interface design, designers can leverage After Effects to create interactive animation prototypes, showcasing interface transitions, element animations, and more, which facilitates communication and testing with team members, thereby enhancing design efficiency.

Data-driven design represents another significant application of digital media technologies within immersive experience design[2]. Eye-tracking technology allows for real-time monitoring of users' gaze focus, enabling the analysis of attention distribution within immersive scenarios. By analyzing eye-tracking data, designers can ascertain

users' levels of engagement with various elements, thereby optimizing narrative pacing and information density[2]. For instance, in web design, eye-tracking studies have revealed that users exhibit higher attention towards content located at the top and left of a page during browsing. Consequently, designers can strategically position crucial information in these areas to enhance information delivery effectiveness. Biofeedback technology, on the other hand, monitors users' physiological indicators such as heart rate and electrodermal responses to gauge their emotional states. This information can then be used to adapt narrative content and pacing in accordance with emotional fluctuations. In immersive horror games, when elevated heart rates and increased electrodermal responses are detected in players, the game system can appropriately amplify the horror elements—such as increasing audio volume or introducing sudden jump scares—to further heighten player tension and immersion.

3 Constructing a Narrative-Driven Immersive Experience Design System

3.1 Design Strategies for Visual Communication Narrative Frameworks

Visual Encoding of Narrative Elements.

The construction of a symbolic system is a critical step in transforming abstract narrative concepts into visual representations. During the design process, it's essential to deeply comprehend the core essence of the narrative content, identify its representative elements, and subsequently translate them into concise, easily recognizable visual symbols through methods like simplification, distortion, and combination. Taking “Memory Fragments” as a case study, a designer could abstract elements such as scenes, characters, and objects from memory and employ fragmented geometric shapes to symbolize the fragmented nature of recollection. These fragmented geometric shapes can vary in form, scale, and hue, and through skillful arrangement, they can evoke a visual effect that is both chaotic and layered, enabling users to intuitively grasp the ambiguity and fragmentation of memory. In practical applications, this symbolic system can be utilized in exhibition wayfinding systems, promotional posters, and digital interfaces, thereby enhancing user comprehension and immersion within the narrative theme.

Dynamic narrative grammar, through visual feedback mechanisms based on user actions, breaks away from the unidirectional nature of traditional storytelling, enabling interaction between the user and the narrative content[4]. A common method for implementing dynamic narrative grammar involves triggering graphical transformations through click interactions. For instance, in an application focused on history and culture, when a user taps an icon representing a historical event, that icon might gradually morph into a relevant scene or a figure associated with the event, accompanied by textual and auditory introductions. This guides the user to delve deeper into the event's details and context. This “action-narrative” closed-loop design not only enhances user

engagement and enjoyment but also allows for personalized narrative experiences tailored to user behavior and interests[4], making the narrative content more aligned with user needs. To achieve a more natural and fluid dynamic narrative grammar, designers must thoroughly consider user interaction habits and expectations, designing appropriate interaction methods and visual feedback effects. In terms of interaction methods, diverse natural interaction techniques such as gesture recognition and voice control can be employed, allowing users to engage with the narrative content more effortlessly. Regarding visual feedback, emphasis should be placed on animation fluidity, rhythm, and expressiveness, using subtle animated effects to vividly present the narrative content to the user, thereby augmenting their sense of immersion and emotional resonance. (Figure 7)

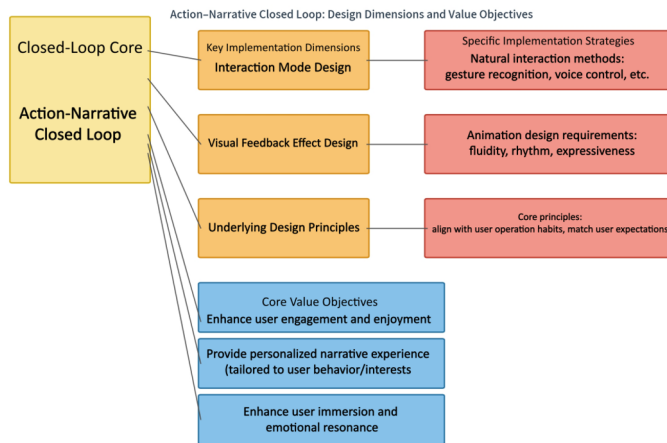


Fig. 7. Action–Narrative Closed Loop: Design Dimensions and Value Objectives

Hierarchical Design of Spatial Narrative.

Physical space narrative, through means such as wayfinding systems and installation art, constructs narrative threads within the real space, guiding users to explore and experience narrative content. The circulation design of exhibition spaces is a crucial manifestation of physical space narrative. A well-conceived circulation design can correspond to the storyline, directing visitors to tour the exhibition in a specific order and rhythm, thereby progressively deepening their understanding of the exhibition's theme and content. When designing exhibition circulation, it is essential to consider factors such as the spatial layout, the distribution of exhibits, and user behavior patterns. By incorporating elements like directional signage, barriers, and rest areas, the user's pathway and dwell time can be managed. For instance, in an exhibition on urban development, the space could be segmented into distinct zones representing the city's past, present, and future. A meandering circulation path could then guide visitors sequentially through these zones, with varied exhibits and interactive installations in each area, allowing users to perceive the context/veins and evolution of urban development during their visit.

Digital space narratives leverage MR (Mixed Reality) technology to overlay virtual narrative layers, offering users a novel visual experience. A common application involves projecting animated historical scenes onto physical artifacts. Through MR, virtual historical animations are integrated with tangible relics, enabling users to more intuitively grasp their historical context and cultural significance. In museum exhibitions, particularly for delicate or highly protected artifacts that cannot be extensively displayed or explained, MR technology can project historical scene animations within their display areas. By wearing MR devices, visitors can witness animations of artifacts in use during historical periods or observe their creation processes, creating a sensation of time travel and direct engagement with history's allure. This approach to digital spatial narration not only enriches exhibition formats and content but also enhances visitor experience and learning outcomes, effectively animating the past. To achieve more life-like and immersive digital spatial narratives, continuous enhancement of MR technology's performance and visual fidelity is crucial. On the hardware front, improvements in MR device resolution, refresh rates, tracking accuracy, and the reduction of latency and motion sickness are essential for providing users with clearer, smoother visual engagement. In terms of software, greater emphasis must be placed on the creation and optimization of historical scene animations to elevate their realism and detail. Concurrently, integrating artificial intelligence technologies will facilitate intelligent analysis and response to user behavior, thereby delivering more personalized narrative experiences.

3.2 Digital Media-Driven Interactive Participatory Creation

Narrative Design for Interactive Interfaces.

Emotive interaction, facilitated by devices such as pressure-sensitive controllers, conveys the intensity variations within a narrative, immersing users more deeply in the story's emotions and atmosphere. During combat sequences, when a user's character executes an attack, the pressure-sensitive controller generates corresponding haptic feedback based on the strike's force and velocity, thereby enhancing user immersion and tension. A powerful, heavy blow from the character will elicit a strong vibration, allowing the user to feel the impact's magnitude, while a lighter strike will result in a more subtle tremor. This nuanced emotive interaction deepens the player's engagement with the game's combat ambiance, elevating its entertainment value and challenge. Beyond haptic feedback, emotive interaction can be achieved through other modalities, including audio and lighting. In horror games, as the user approaches a hazardous zone, the background music volume will progressively increase with a more rapid tempo, while ambient lighting will gradually dim, collectively establishing a terrifying atmosphere that accelerates the user's heart rate and amplifies the game's sense of dread and immersion.

User-Co-Created Narrative Generation Mechanism.

User-generated content (UGC) integration allows for user-driven customization of character appearances and narrative path selections, thereby expanding creative scope

and personalizing the player experience[2]. A prime example is “Detroit: Become Human,” where players can direct the protagonist's actions and decisions based on their preferences, significantly impacting the game's plot progression and ultimate conclusion. Players have the agency to choose between protagonist defiance against human oppression or peaceful coexistence, with divergent choices leading to varied story developments and endings. This multi-ending narrative system substantially enhances replayability and overall engagement. Beyond branching plotlines, users can personalize character attributes such as appearance, personality, and skills, aligning the avatar with their self-image and requirements. In certain RPGs, players can curate unique character aesthetics and styles by acquiring diverse equipment and items. Concurrently, character capabilities and combat prowess can be augmented through leveling up and skill acquisition. Such UGC integration in game design effectively stimulates player creativity and engagement, positioning users as co-creators within the game's narrative.

Real-time collaborative storytelling, leveraging blockchain technology, enables users to co-edit virtual environments, thereby forging a “digital symbiosis” of collective narratives. The decentralized, immutable, and traceable attributes inherent in blockchain technology provide a robust technical foundation for this real-time collaborative storytelling. Within a blockchain-based virtual world, users can collectively participate in the creation and modification of environments, with each user's actions immutably recorded on the blockchain, thereby ensuring data integrity and authenticity. Users can collaboratively design elements such as terrain, architecture, and characters within virtual scenes, working together to realize a complete narrative world. Throughout this process, the interactions and communications between users give rise to new storylines and plot developments, cultivating a “digital symbiosis” of collective narrative. This method of real-time collaborative storytelling not only fosters social interaction and cooperation among users but also generates richer and more diverse narrative content, offering users an entirely novel experience. To achieve more efficient and seamless real-time collaborative storytelling, further advancements in blockchain technology's performance and application scenarios are imperative. In terms of performance, enhancing blockchain transaction speed and throughput, while reducing costs, is crucial to ensure timely responses to user operations. Regarding application scenarios, continuously expanding the domains and scope of real-time collaborative storytelling, encompassing areas such as education, art, and culture, will empower more users to engage in the creation of collective narratives, collectively building more captivating digital worlds.

4 Practical Cases and Technical Validation

4.1 Immersive Cultural Heritage Experiences: A Case Study of the Dun Huang Digital Library Cave

Narrative Framework Design.

In the “Dunhuang Digital Scripture Cave” project, visual communication design played a crucial role. Through meticulously crafted animated brushstrokes and thought-

ful color palettes, we presented users with a vivid historical panorama[5]. When replicating the murals, the animated brushstrokes precisely recreated the artist's process, from the initial outlines to the final color fills. Every detail was rendered with lifelike fidelity, transporting users through time to witness the creation process of ancient artists firsthand. This dynamic presentation not only enhanced visual engagement and appeal but also provided users with a deeper understanding of the murals' artistic techniques and inherent value.

Color psychology plays a pivotal role in distinguishing the emotional tonality of different Buddhist scripture narratives. For sutras that recount tales of compassion and universal salvation, warm hues such as golden yellow and fiery orange are employed to cultivate an atmosphere of warmth and serenity, enabling recipients to experience Buddhism's benevolence and tolerance. Conversely, narratives illustrating karma, reincarnation, and the retribution of good and evil are rendered with cool tones like deep blues and purples. This evokes a sense of mystery and solemnity, allowing individuals to grasp the profound implications of the stories visually. Through the judicious application of color, recipients can more intuitively comprehend the emotional arc of Buddhist narratives, thereby deepening their perception and understanding of Buddhist culture.

In terms of interactive design, the “Dunhuang Digital Sutra Cave” establishes a narrative loop of “viewing—exploration—learning” through user interaction with “virtual scrolls.” Users can explore these virtual scrolls using simple gestures, such as zooming and rotating. When a user zooms in on a virtual scroll, they can clearly discern the intricate details of the text and imagery, akin to personally handling an ancient manuscript. Activating the Buddhist scripture interpretation function, which utilizes AR projection, causes the text on the scroll to materialize as an AR projection, accompanied by detailed audio narration. This feature delves into the content, historical context, and cultural significance of the scriptures. As users engage with the scrolls, they not only appreciate the exquisite artifacts but also acquire extensive knowledge of Buddhist culture, effectively transforming them from passive observers to active learners. This interactive design enhances user engagement and learning interest, thereby making the dissemination of cultural heritage more dynamic and effective. (Figure 8)



Fig. 8. Interactive Scenario of Virtual Scrolls in the Dun Huang Digital Library Cave

Application of Digital Technologies.

To achieve a high-precision restoration of the Dunhuang Cave manuscripts and artifacts, the “Digital Dunhuang Cave” project employs advanced 3D scanning and texture mapping technologies[3]. Through 3D scanning, precise three-dimensional models of the artifacts are acquired, capturing information such as shape, dimensions, and surface details. Subsequently, texture mapping technology is utilized to accurately project the scanned artifact surface textures onto the 3D models, rendering the virtual artifacts virtually indistinguishable from their real counterparts in appearance. When recreating a Buddha statue, 3D scanning technology captures the subtle expressions on the Buddha's face, the textural nuances of the clothing's folds, and intricate decorative details on the body. Through texture mapping, these details are then flawlessly rendered, allowing users to perceive the statue's solemnity and exquisite craftsmanship even within a virtual environment. This high-precision restoration technology offers users a more authentic and intuitive cultural heritage experience, thereby contributing to the enhanced preservation and transmission of Dunhuang culture[3].

The implementation of collaborative exploration of the same virtual Dunhuang Grottoes scene by multiple users relies on the support of a spatial positioning system. In this project, we employed advanced spatial positioning technology that enables real-time tracking of each user's location and actions within the virtual environment. Multiple users can simultaneously enter the virtual Dunhuang Grottoes scene, engaging in voice communication and gestural interaction to jointly unravel the mysteries of the grottoes. Users can collectively examine murals, discuss the content of scrolls, and share their discoveries and insights, creating an experience akin to being on an actual archaeological site. This collaborative exploration model not only enhances user interactivity and social engagement but also fosters knowledge exchange and cultural dissemination among users, making the experience of cultural heritage richer and more engaging.

4.2 Immersive Retail for Business Experience: A Case Study of “Intelligent Beauty Narrative Space”

Narrative Framework Design.

The “Intelligent Beauty Narrative Space” crafts a personalized beauty storytelling experience for users through dynamic mirror installations and AI algorithms[7]. The dynamic mirror apparatus real-time maps users' makeup, displaying their facial features with clarity. Integrated AI algorithms analyze user style preferences and inherent temperament based on facial characteristics, skin tone, hairstyle, and other data, generating bespoke beauty narrative themes such as “Urban Chic” or “Retro Diva.” Within the “Urban Chic” theme, the AI recommends minimalist, professional makeup suitable for the workplace, complemented by sophisticated hairstyles and fashionable attire, while illustrating the efficacy of this look across various urban scenarios like business meetings and social gatherings. This allows users to visually perceive their beautiful persona in different contexts. Such personalized beauty narrative design not only fulfills users' pursuit of beauty but also fosters confidence and a sense of identity through the experience, thereby strengthening the emotional connection between the user and the brand[7].

The “Intelligent Beauty Narrative Space” crafts a “Five Senses Narrative” experience by interacting with a fragrance installation. This immersive approach engages users across visual, auditory, olfactory, tactile, and gustatory senses, allowing them to fully appreciate the allure of beauty products. Upon touching the fragrance device, users trigger corresponding visual animations and background music. Each distinct fragrance is curated to align with specific beauty themes and emotional ambiances. For instance, a refreshing citrus scent might be paired with sunlit garden animations and upbeat music, evoking a sense of vibrancy and freshness suitable for natural, dewy makeup looks. Conversely, a rich rose fragrance could be accompanied by romantic evening gala scenes and elegant melodies, creating an atmosphere of sophistication and allure, ideal for glamorous evening makeup. This multisensory narrative strategy enables a deeper user immersion into the world of beauty, enhancing their perception and comprehension of cosmetic products and, consequently, stimulating purchase intent. (Figure 9)



Fig. 9. Interactive Cosmetic Mirror for Beauty & Makeup

Application of Digital Technology.

In the realm of “Intelligent Beauty Narrative Spaces,” computer vision technology plays a pivotal role, enabling real-time identification of user facial features and the generation of virtual makeup simulations. By scanning a user's face via camera, computer vision algorithms swiftly and accurately detect facial contours, feature placement, skin tone, and skin texture. Leveraging this data, the system can generate a diverse array of makeup effects within moments. Users can effortlessly explore various lipstick shades, eyeshadow styles, blush placements, and more, simply by selecting options on screen, instantly visualizing their appearance with the chosen makeup. This capability eliminates the need for physical application of cosmetics, thereby saving time and resources while mitigating potential skin irritation from beauty products. This real-time makeup simulation functionality enhances the user's ability to make informed decisions about suitable beauty products, ultimately improving shopping efficiency and customer satisfaction.

The interlinking of Internet of Things (IoT) devices provides the technical backbone for dynamic adjustments within the narrative scenes of our “Smart Beauty Narrative Space.” Lighting and audio systems are now intimately connected with user interactions through IoT. When a user engages with a fragrance diffuser or other interactive devices within the experience zone, IoT devices meticulously capture real-time behavioral data. This information is then transmitted to the lighting and audio systems. Based on the user's specific interactions, these systems dynamically recalibrate the narrative environment. For instance, if a user is exploring a fragrance product with a mysterious ambiance, the lighting will gradually dim, creating an atmosphere of enigmatic shadows and light. Concurrently, the background music will deepen in tone and become more resonant, heightening the sense of mystery and fostering deeper immersion in the beauty narrative. This coordinated interplay of IoT devices imbues the entire experiential space with enhanced intelligence and personalization, ultimately elevating user immersion and the overall quality of the experience[7].

5 Challenges and Future Outlook

5.1 Balancing Technical Ethics and User Experience

Potential Risks of Immersive Experiences.

The rapid advancement of digital media technology has led to the widespread adoption of immersive experiences across various sectors. However, these experiences also present potential risks that warrant careful consideration[8]. Sensory overload is a common issue within immersive environments. In such settings, users are frequently exposed to intense stimuli from multiple senses, including vision, hearing, and touch. When these stimuli become excessively complex or strong, users may experience discomfort such as dizziness or distraction. In some virtual reality games, rapid scene transitions and intense motion feedback can induce vertigo in certain individuals, negatively impacting their experience and well-being. To address this challenge, a dynamic adjustment mechanism for interaction intensity is necessary. Real-time monitoring of users' physiological states, such as heart rate, blood pressure, and eye movements, via sensors, allows for automatic adjustment of interaction intensity based on the user's condition, thereby preventing overstimulation. When the system detects an accelerated heart rate or abnormal eye movements, it can reduce the frame rate of visuals, lower audio volume, or modulate the intensity of haptic feedback to alleviate sensory burden and ensure users can enjoy immersive experiences comfortably.

Narrative hegemony is also a critical concern in immersive experiences. Some immersive experience designs may over-prescribe narrative pathways, thereby limiting user autonomy to a degree. Users might be confined to following pre-determined plot developments, lacking space for free exploration and choice, which could lead to diminished engagement and satisfaction. In certain immersive theater productions, audience actions and choices are strictly curtailed, forcing passive observation of actors' performances and precluding genuine participation in the narrative's creation. This type of experience can leave audiences feeling a lack of agency and creativity. To circumvent narrative hegemony, a balance must be struck between “guided narrative” and

“free exploration.” Designers can implement open-ended narrative structures with multiple plot branches and endings, enabling users to shape the story's trajectory based on their interests and decisions[6]. Within immersive gaming, multiple quest lines and character development paths can be established, allowing users to select different tasks and growth trajectories according to their preferences and capabilities, thereby achieving a more personalized and autonomous narrative experience. Concurrently, designers can provide appropriate guidance and prompts to assist users in better comprehending the story's background and objectives, preventing them from becoming disoriented during free exploration.

Data Privacy and Ethical Considerations.

In immersive experience design, data privacy and ethical considerations are paramount[8]. As technology advances, immersive systems can collect vast amounts of user data, including biometric information (e.g., eye-tracking, heart rate) and behavioral patterns. The collection and utilization of this data directly impact user privacy and personal information security, necessitating stringent data protection measures. Safeguarding biometric data is particularly critical. Eye-tracking technology, for instance, can precisely record a user's gaze focus, enabling analysis of attention distribution. Heart rate monitoring devices can track real-time physiological responses, offering insights into emotional states. While this biometric data holds significant value for optimizing immersive experiences, it inherently contains sensitive personal information. To ensure the security of biometric data, encryption technologies must be employed for both transmission and storage, guaranteeing data integrity and preventing unauthorized access or alteration. Furthermore, robust access control mechanisms should be implemented, restricting data access and usage to authorized personnel only, thereby mitigating the risks of data breaches and misuse.

Algorithmic recommendations also play a significant role in immersive experiences, but they carry an inherent risk of subtly manipulating users' narrative choices[9]. Recommendation algorithms curate relevant narrative content based on a user's historical behavior and preferences. However, this personalization can lead to users becoming ensconced in filter bubbles, exposed only to content aligning with their tastes while disregarding diverse information[9]. Furthermore, algorithmic recommendations can be influenced by commercial interests, prioritizing advertisements or paid content, thereby shaping a user's narrative selection. To mitigate the implicit risks of algorithmic manipulation, enhancing the transparency and interpretability of these systems is crucial. Empowering users with an understanding of the principles and rationale behind recommendations allows them to make autonomous decisions about accepting suggested content. Concurrently, robust oversight of algorithmic recommendations is necessary to prevent misuse and ensure users can exercise their narrative choices within a fair and equitable environment.

5.2 Future Trends: The Narrative Evolution from “Experience” to “Symbiosis”

Narrative Reconstruction in the Met-averse Scenario.

The met-averse, as a new frontier in digital technology, presents unprecedented opportunities for narrative reconstruction. Within the metaverse, decentralized narratives are emerging as a significant trend. Users can actively participate in the construction of virtual world narratives through NFT digital assets, acquiring unique digital identities and possessions, thereby enabling free creation and expression in these virtual realms. In metaverse gaming, users can acquire or create NFT digital art, displaying it within their personal virtual spaces. These artworks possess not only collectible value but also become integral components of the narrative, articulating the user's personal story. Furthermore, users can engage in virtual world economic activities, such as trading and investment, through NFT digital assets, which in turn influence the evolution of metaverse narratives. Decentralized narratives dissolve the traditional boundaries between creators and users, positioning users as the true agents of narrative, thereby fostering narrative diversification and personalization.

Cross-platform narrative is also a key characteristic of narrative reconstruction within the metaverse. A single intellectual property (IP) can engage in narrative synergy across multiple terminals, including physical exhibitions, VR games, and social media, thereby forming an organic narrative whole. In physical exhibitions, visitors can gain an initial understanding of the IP's backstory and main plot through tangible exhibits and exhibition spaces. Within VR games, players can immerse themselves in the IP's virtual world, interact with characters, and delve into the story's nuances and progression. On social media platforms, users can exchange their interpretations and feelings about the IP with others through sharing and discussions, further enriching the narrative content. Through this cross-platform narrative approach, users can experience the charm of the same IP in various contexts, enhancing their recognition and emotional connection to it. For instance, a renowned anime IP, concurrently with the release of its animated works, hosts offline themed exhibitions showcasing character models and in-universe props. It also develops VR games, allowing players to embark on adventures with the anime characters in a virtual realm. On social media, fans can share their cosplay creations and fan fiction, fostering a vast fan community. This cross-platform narrative strategy has significantly amplified the influence of this anime IP.

Sustainable Narrative Design.

Sustainable narrative design is a key developmental trajectory for future immersive experience design[8]. In terms of eco-themed narratives, employing digital media technology to depict ecological crisis scenarios can effectively drive behavioral change in users. Through virtual reality (VR) technology, users can experience firsthand the severe consequences of ecological crises such as deforestation, marine pollution, and climate change, thereby deepening their understanding and concern for environmental issues. In an immersive experience project focused on marine conservation, users donning VR equipment can witness oceans choked with plastic waste and marine life strug-

gling for survival amidst the debris. This visceral experience can ignite users' environmental consciousness, prompting them to take action in real life, such as reducing their use of single-use plastics and participating in environmental protection initiatives. Furthermore, digital media technologies can impart environmental knowledge and skills to users through interactive games, educational modules, and other formats, guiding them toward adopting sustainable lifestyles.

Cultural heritage narratives are also a crucial element in sustainable narrative design. By revitalizing intangible cultural heritage through immersive experiences, we can foster a virtuous cycle of “narrative dissemination leading to cultural identity.” Intangible cultural heritage embodies rich historical and cultural connotations, yet its unique transmission methods put many of these invaluable traditions at risk of extinction. Utilizing immersive experience design allows us to present intangible cultural heritage to the public in a more vivid and engaging manner, thereby increasing awareness and appreciation of its value. For instance, in an immersive project centered on traditional paper-cutting art, users can observe the creation process through AR technology on their mobile devices, learn cutting techniques, and even display their own paper-cut creations in real-world spaces via AR, sharing them with others. This immersive experience not only allows users to engage with the artistry of traditional paper cutting but also strengthens their sense of cultural identity and pride, ultimately promoting the preservation and development of intangible cultural heritage.

6 Conclusion

Narrative-driven immersive experience design represents an innovative product born from the deep integration of visual communication and interactive design in the digital age. Through the narrative encoding of visual elements, the empowerment of digital technologies, and user-participatory creation, we construct a narrative field that transcends physical and digital spaces. From the digital preservation of cultural heritage to the experiential enhancement of commercial retail spaces, immersive experience design has demonstrated immense application potential across various domains.

However, the rapid advancement of technology has also introduced a series of challenges, including issues such as sensory overload, narrative hegemony, and data privacy. In the future, immersive experience design must strike a balance between technological innovation and user experience, exploring more sustainable and human-centrism narrative strategies. With the emergence of new concepts like the metaverse, immersive storytelling is poised for a paradigm shift from mere “experience” to “symbiosis,” fostering a more open and diverse narrative ecosystem[1].

References

1. Wang, Jiahang. “Narrative Change: Reconstruction of News Expression Driven by Technology.” **News and Writing**, no. 06, 2016, pp. 9-12.

2. Tie, Zhong, Xia, Cuijuan, Huang, Wei, et al. "Event-Driven Data Visualization Interaction Design: Exploration and Practice Based on 'Data Storytelling'." *Journal of Library Science in China*, vol. 49, no. 04, 2023, pp. 72-87. DOI: 10.13530/j.cnki.jlis.2023032.
3. Chen, Zhe. "Visual Communication Design Integrating New Media Technology." *Packaging Engineering*, vol. 41, no. 20, 2020, pp. 280-283. DOI: 10.19554/j.cnki.1001-3563.2020.20.047.
4. Li, Xiaomei. "Dynamics, Metaphors, and Dimension Elevation—Narrative Design in Visual Communication." *Decoration*, no. 09, 2021, pp. 29-33. DOI: 10.16272/j.cnki.cn11-1392/j.2021.09.004.
5. Wang, Hong, and Suren Liu. "Immersion and Narrative: Research on Museum Cultural Immersive Experience Design under New Media Imaging Technology." *Art Hundred Families*, vol. 34, no. 04, 2018, pp. 161-169.
6. Hu, Yiqing. "Innovation and Development of Visual Communication Design in the Context of Digital Media Art." *Art Hundred Families*, vol. 35, no. 06, 2019, pp. 188-192.
7. Liu, Yao. "'Redesign' of Visual Communication Design in the New Media Era." *Art Hundred Families*, vol. 37, no. 02, 2021, pp. 202-206.
8. Hu, Fei, and Jianghui Mi. "Research on Domain Methods and General Methods in Design Studies." *Journal of Nanjing Arts Institute (Fine Arts and Design Edition)*, no. 05, 2022, pp. 70-77+216.
9. Guo, Jinjin, and Weijun Chen. "Turn and Reshape: Research on Short Video News Storytelling Driven by Data." *Friend of Editors*, no. 04, 2023, pp. 70-75. DOI: 10.13786/j.cnki.cn14-1066/g2.2023.4.010.

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