

Innovation of Narrative Logic and Construction of Immersive Experience in Exhibition Design Empowered by Digital Media Technology

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ABSTRACT This study focuses on the "technology-narrative-experience" collaborative mechanism to systematically explore how digital media technology empowers innovative paths in exhibition design. By integrating digital narratives, interactive media, and immersive spatial expression, the research redefines the visitor experience in contemporary exhibitions. It defines core concepts and supporting systems such as narratology and flow theory, analyzes the limitations of traditional narrative logic, and proposes four innovative dimensions: co-creation of narrative subjects, non-linearization of structures, scenarization of content, and cross-temporality of contexts. The research clarifies the four core components of immersive exhibition experiences—space, content, technology, and users—and constructs a construction path based on multi-sensory collaboration, interactive participation, emotional resonance, and technology integration. Verified through three typical cases, the study summarizes the collaborative law of "technology serving content, narrative supporting experience, and experience feeding back optimization." By enriching the interdisciplinary theoretical framework of exhibition design, this research provides technical optimization and practical guidance for cultural exhibitions, science exhibitions and brand display scenarios, supporting high-quality digital transformation of exhibition experiences.

INDEX TERMS digital media technology, exhibition design, narrative logic, immersive experience, wireless interaction

I. INTRODUCTION

A. RESEARCH BACKGROUND AND PROBLEM STATEMENT

1) Development of Digital Media Technology and Transformation Demand of Exhibition Design

ALIGNING with the 14th Five-Year Plan's "digital strategy for the cultural industry," this study integrates museum digitalization into the national cultural big data system to provide a robust policy framework for the digital evolution of textile industrial heritage and garment exhibitions [1]. This alignment facilitates the systematic transition of traditional textile craftsmanship into the digital era through advanced exhibition design. In recent years, digital media technologies such as interactive projection, VR/AR, Artificial Intelligence (AI), and big data have iterated rapidly. Their dynamic, interactive, and immersive characteristics are highly consistent with modern audiences' diversified demands for exhibition experiences [2]. The traditional exhibition model centered on physical objects and graphics/texts can no longer meet audiences' needs for in-depth participation and emotional resonance [3]. Promoting

the transformation of exhibition design into a digitally enhanced innovative model has become an industry consensus, rather than dismissing non-digital approaches outright.

2) Narrative Dilemmas and Experience Limitations of Traditional Exhibition Design

The narrative logic of traditional exhibition design exhibits certain limitations, though it is overly simplistic to characterize it as merely "one-way linear" and "passive": In terms of communication mode, traditional exhibitions are often constrained by physical carriers, leading to relatively fixed information transmission paths that restrict audience autonomy compared to digital models [4]; In terms of content expression, it relies on static physical objects and graphics/texts, making it difficult to present dynamic procedural content and contextual background information, resulting in insufficient narrative appeal [5]; In terms of participation methods, audiences mainly engage in "onlooker-style" visits with limited interaction, making it hard to form in-depth immersive experiences [6]. These issues significantly reduce the communication efficiency and effectiveness of exhibition

content, restricting the full play of exhibition design functions. It is acknowledged that traditional spatial design may employ "circulatory" or "radiating" paths for non-linear exploration, and successful non-digital narrative strategies do exist. However, the aforementioned limitations highlight the need for digital supplements to expand exhibition potential, rather than replacing traditional approaches entirely.

3) Era Demand for Narrative and Experience Innovation in Exhibition Design Under digital enhancement

In the digital era, traditional museum exhibition methods can no longer fully meet visitors' needs for aesthetic enhancement and interactive participation. The core function of exhibition design has shifted from "information transmission" to "experience creation" [2].

Whether it is museums, science and technology centers, or commercial exhibitions, there is an urgent need to realize the innovation of narrative logic and the upgrading of immersive engagement through digital enhancement to enhance audience appeal and improve the effects of cultural communication, popular science education, or commercial marketing [7].

How to use digital media technology to address the narrative limitations of traditional exhibitions—while avoiding digital fatigue and technical barriers—and construct a scientific and reasonable immersive experience system has become a core issue to be solved in the field of exhibition design.

B. RESEARCH SIGNIFICANCE

1) Theoretical Significance

This study focuses on the collaborative relationship between digital media technology, exhibition narrative, and immersive experience, enriches the interdisciplinary theoretical system of exhibition design, digital narrative, and user experience, and provides a new analytical framework and theoretical perspective for subsequent research in related fields.

2) Practical Significance

This research clarifies the innovative dimensions of textile narrative logic and the construction path of immersive experiences by leveraging digital media technology to weave intricate fabric histories and material textures into interactive exhibition environments. By extracting practical experience from typical cases, it can provide specific technical application and scheme optimization guidance for various exhibition design practices such as museums, science and technology centers, and commercial exhibitions, helping exhibition design achieve high-quality development.

C. REVIEW OF DOMESTIC AND FOREIGN RESEARCH STATUS

Existing research mainly focuses on three directions:

(1) Research on the application of digital media technology in exhibitions: Internationally, digital media technology

has become an important part of museum exhibition design, with many countries investing heavily in this field. Museums such as the "World Museum" in Texel (Netherlands), the "Los Angeles Museum of the Holocaust" (USA), the "Memorial Museum of Tolerance" (Mexico), and the "Melbourne Museum" (Australia) have extensively adopted digital media technology in their exhibition designs [8].

Domestically, digital media technology has been widely applied in exhibitions of large museums, focusing on exploring the adaptability and function realization of technologies such as VR/AR and interactive projection [9]. For example, the digital exhibition practice of the Memorial of the First National Congress of the Communist Party of China has verified the role of multi-technology integration in scene restoration [10].

(2) Research on exhibition narrative logic: Most studies focus on the optimization of traditional narrative frameworks [11], with limited discussion on narrative transformation under digital enhancement.

(3) Research on the integration of immersive experience and exhibitions: It emphasizes the description of experience effects [12], lacking systematic analysis of construction paths.

D. RESEARCH CONTENT AND METHODS

1) Core Research Content

The core research content of this paper includes:

(1) Defining core concepts such as digital media technology and exhibition design, as well as theoretical foundations;

(2) Analyzing the limitations of traditional exhibition narrative logic and the innovative dimensions brought by digital technology;

(3) Exploring the core components and construction paths of exhibition immersive experiences driven by digital technology;

(4) Verifying research conclusions through typical cases and extracting general laws.

2) Research Methods

(1) Literature research method: Systematically sorting out research results and theories in fields such as digital media technology, exhibition narrative, and immersive experience;

(2) Case study method: Selecting three types of typical cases (museums, science and technology centers, and commercial exhibitions) to conduct in-depth analysis of the practical logic of technical application, narrative innovation, and experience construction;

(3) Interdisciplinary research method: Integrating theories from narratology, psychology, design, and other disciplines to construct a comprehensive analytical framework;

(4) Empirical research method: Verifying the effect of experience construction by combining audience feedback data from some cases.

II. OVERVIEW OF CORE CONCEPTS AND CORE THEORIES

A. DEFINITION OF CORE CONCEPTS

This study involves four core concepts, whose core connotations are defined as follows:

(1) Digital media technology: Refers specifically to exhibition-adapted core technologies, including interactive projection, VR/AR, artificial intelligence, and big data. It has dynamic, interactive, and immersive characteristics, with the core function of providing technical support for the construction of exhibition narrative and experience;

(2) Exhibition design: A comprehensive space and content design centered on information transmission and experience creation, showing new characteristics of digitization, interaction, and scenarization under digital enhancement [13];

(3) Narrative logic: In the context of exhibitions, it refers to the logic of information organization and transmission, focusing on the four core issues of "who tells, how to tell, what to tell, and where to tell," which directly determines the efficiency and effectiveness of information communication [14];

(4) Immersive experience: A "being-there" perceptual state formed by audiences through multi-sensory participation in exhibition scenarios, with core components including sensory immersion, interactive participation, and emotional resonance.

B. CORE THEORETICAL SUPPORT

1) Narratology Theory

Narratology theory emphasizes the construction, transmission, and reception of stories, focusing on enabling audiences to generate emotional resonance and logical recognition through the design of plots, scenes, and characters [15].

Traditional narratology emphasizes linear narrative structures [16], while narratology in the digital era focuses more on non-linear and interactive narratives, which is highly consistent with the transformation of exhibition narrative empowered by digital media technology and provides theoretical guidance for exploring narrative logic innovation [14].

2) Flow Theory

Proposed by Csikszentmihalyi, the core of this theory is that when individuals participate in an activity, if they can achieve a state of "matching challenges and skills," they will enter a fully focused "flow" state [17]. In the context of textile exhibitions, "skills" refer to the audience's cognitive abilities (e.g., understanding textile weaving principles), operational abilities (e.g., manipulating interactive devices to simulate weaving), and analytical abilities (e.g., comparing different fabric textures through digital tools). "Challenges" involve tasks such as completing a virtual weaving process, identifying fabric material differences via digital magnification, or designing a simple textile pattern using AR tools. This theory clarifies the core conditions for the

occurrence of immersive experiences, provides a key basis for the construction of immersive exhibition experiences, and guides designers to balance the difficulty of audience participation and their own skills through technical means.

3) User Experience Design (UXD) Theory

Museum exhibition spaces constructed in the form of "exhibits + texts" are often exhibit-centered, placing the display of cultural relics and historical records in a dominant position while ignoring the subjective feelings and participation of audiences. In contrast, user experience design theory takes user needs as the core and emphasizes optimizing design schemes from the user's perspective [18]. This theory provides the core principle of "audience-centricity" for exhibition design, ensuring that exhibition effects meet audiences' cognitive and emotional needs.

III. INNOVATION OF NARRATIVE LOGIC IN EXHIBITION DESIGN EMPOWERED BY DIGITAL MEDIA TECHNOLOGY

A. CORE CHARACTERISTICS AND LIMITATIONS OF TRADITIONAL EXHIBITION NARRATIVE LOGIC

1) Linear Narrative Structure: One-way Information Transmission Mode

Traditional exhibitions mostly adopt linear narrative structures based on "chronological order" or "thematic progression," with fixed information transmission paths. Audiences can only receive information in the order preset by designers, lacking independent choice and making it difficult to focus on key content according to their own interests, resulting in low information reception efficiency.

2) Static Narrative Content: Limitations of Expression Centered on Physical Objects/Graphics/Texts

Traditional exhibitions mainly rely on static carriers such as physical objects, pictures, and texts to transmit information, making it difficult to present dynamic procedural content and contextual background information. For example, in historical exhibitions, it is hard for audiences to intuitively feel the occurrence process of historical events only through cultural relics and text introductions, leading to insufficient narrative appeal.

3) Passive Narrative Reception: Dilemma of "Onlooker-style" Participation by Audiences

In traditional exhibitions, designers are the absolute dominators of narrative, and audiences only receive information as "onlookers" without channels or methods to participate in the narrative. This passive participation model results in a lack of in-depth interaction between audiences and exhibition content, making it difficult to form profound cognitive and emotional memories.

B. INNOVATIVE DIMENSIONS OF EXHIBITION NARRATIVE LOGIC UNDER DIGITAL ENHANCEMENT

1) Transformation of Narrative Subjects: From "Designer-led" to "Audience Participation and Co-creation"

Digital media technology has broken the monopoly of designers on narrative. Through interactive devices, audiences can participate in the selection, advancement, and even creation of narrative content. This "co-creation" is not absolute freedom but rather meaningful participation within a flexible technical framework. For example, in textile exhibitions, audiences can use AR tools to adjust weaving patterns, combine fabric textures, and share their creations—functions supported by a modular technical system rather than rigid pre-programming. This ensures that the technical environment does not hinder true audience agency but provides structured support for co-creation.

2) Breakthrough of Narrative Structure: Construction of Non-linear, Multi-threaded, and Interactive Narrative Frameworks

Relying on digital technology, exhibition narrative has broken away from the constraints of linear structures and built multi-threaded and non-linear narrative frameworks. Audiences can freely switch narrative paths according to their own needs, forming personalized visiting experiences. For example, in digital museums, audiences can understand history in chronological order or conduct in-depth exploration according to thematic dimensions, enhancing the autonomy of information acquisition.

3) Expansion of Narrative Content: Generation of Digitalized, Scenarized, and Dynamic Content

Digital technology has realized the diversified expansion of narrative content:

(1) Digitized content: Converting static cultural relics and text records into digital formats (e.g., 3D models of ancient fabrics) for convenient storage and interactive access;

(2) Scenarized content: Constructing contextual scenes (e.g., simulating ancient textile workshops) to place content in specific historical or cultural backgrounds;

(3) Dynamic content: Presenting procedural information (e.g., weaving process animations) to show the evolution or operation of textile-related content.

Additionally, combining big data technology to dynamically adjust narrative content according to audience needs improves content adaptability and appeal.

4) Innovation of Narrative Context: Cross-temporal Narrative and Virtual-Reality Integrated Narrative Scenes

Technologies such as VR/AR have broken the limitations of time and space, constructing cross-temporal narrative contexts. For example, VR technology allows audiences to "travel" to the scene of historical events, or AR technology combines virtual content with real exhibits to form a "virtual-real coexistence" narrative scene, enhancing the intuitiveness and appeal of the narrative.

5) Innovative Practices of Narrative Logic Empowered by Different Digital Technologies

Different digital media technologies have different characteristics, and their innovative directions and practical scenarios in empowering exhibition narrative also vary, as shown in Table 1:

IV. CONSTRUCTION OF IMMERSIVE EXHIBITION EXPERIENCES DRIVEN BY DIGITAL MEDIA TECHNOLOGY

A. CORE COMPONENTS OF IMMERSIVE EXHIBITION EXPERIENCES

1) Spatial Component: From Physical Space to Virtual-Physical Integrated Space

Digital technology has broken the limitations of physical space, constructing a "virtual + physical" integrated space.

Physical space provides the basic carrier, while virtual space expands the spatial dimension through technical means, forming an all-round spatial sense of enclosure and laying the spatial foundation for immersive experiences. For example, the immersive theater of the Memorial of the First National Congress of the Communist Party of China constructs virtual historical scenes through the CAVE image system, which integrates with the physical space to form an immersive environment.

2) Content Component: From Static Information to Dynamic Interactive Content

Dynamic interactive content is the core support of immersive experiences. Through digital technology, static information is converted into interactive dynamic content, allowing audiences to shift from "watching" exhibitions to "playing" with them, enhancing participation. For example, digital sand tables enable audiences to intuitively understand the urban development process through dynamic images and interactive operations, improving the interest of information reception.

3) Technical Component: Adaptation and Integration of Core Supporting Technologies

The "Technical Component" refers to a functional system that selects, configures, and coordinates core supporting technologies to serve narrative logic and experience goals. It is not merely "adaptation and integration" but a targeted technical framework designed to realize specific exhibition functions (e.g., simulating textile weaving interactions, presenting dynamic craftsmanship processes). A single technology is difficult to achieve in-depth immersive experiences, so it is necessary to integrate different technologies according to their characteristics. For example, immersive theaters integrate naked-eye 3D, surround sound, motion capture, and other technologies to construct an immersive environment from visual, auditory, tactile, and other multi-dimensional perspectives, improving the experience effect.

TABLE 1. Innovation and Application of Exhibition Narrative Empowered by Digital Technologies

Type of Digital Media Technology	Direction of Narrative Innovation	Typical Application Scenarios
Interactive Projection Technology	Real-time generation and feedback of dynamic narrative scenes, enhancing narrative interactivity	In historical exhibition halls, audiences touch the projection area to trigger dynamic restoration of historical scenes
VR/AR Technology	Construction of immersive narrative spaces and realization of cross-temporal narrative	In museums, VR restores ancient palace scenes, and AR overlays historical information of cultural relics
Artificial Intelligence Technology	Intelligent matching of personalized narrative paths to adapt to different audience needs	In science and technology centers, AI recommends customized guided narrative content according to audiences' age and interests
Big Data Technology	Iterative optimization of narrative content based on user behavior to improve narrative appeal	In commercial exhibitions, key narrative content is adjusted according to audiences' stay time

4) User Component: Precise Matching of Experiences Based on User Needs

The core of immersive experiences is "user-centricity," which requires designing experience content in combination with audiences' age, cognitive level, and interest needs. For example, designing interactive and low-difficulty experience projects for children, and in-depth exploration experience content for professional audiences.

B. CONSTRUCTION PATHS AND TECHNICAL IMPLEMENTATION OF IMMERSIVE EXPERIENCES

1) Multi-sensory Collaboration Path: Multi-sensory Integration Design

Construct an all-round sensory sense of enclosure through the collaborative design of multi-sensory stimuli such as vision (projection, LED screens), hearing (surround sound, sound effects), touch (interactive devices), and smell (scene odor simulation). In terms of technical implementation, sensors and control systems are needed to realize the synchronization and linkage of multi-sensory signals, ensuring the coordination of sensory experiences.

2) Interactive Participation Path: Design from Passive to Active Participation

Design hierarchical interactive participation models, from low-difficulty touch interaction and gesture interaction to high-difficulty content co-creation interaction, to meet the participation needs of different audiences. In terms of technical implementation, touch sensors, motion capture, voice recognition, and other technologies are adopted to reduce participation thresholds and improve interaction fluency.

3) Emotional Resonance Path: Emotional Trigger Design Based on Narrative

Centered on narrative content, trigger audiences' emotional resonance through scene restoration, story interpretation, and other methods. It is emphasized that emotional resonance is not an automatic result of technology; instead, it requires close integration of technical means with textile cultural connotations (e.g., using VR to reproduce the inheritance stories of intangible textile techniques). In terms of technical implementation, virtual characters, on-site shooting, emotional sound effects, and other means are combined

to enhance the emotional appeal of the narrative, allowing audiences to generate emotional resonance in immersion.

4) Technical Integration Implementation: Construction of Multi-technology Collaborative Systems

Build a modular and flexible technical system to realize the coordinated operation of technologies such as projection, VR/AR, and interactive devices. Unlike a rigid "core control system" for "unified scheduling," this system adopts a modular design that allows audiences to combine different technical modules for creative expression (e.g., selecting weaving patterns in AR modules and matching fabric textures in 3D modeling modules).

At the same time, optimize the compatibility and stability of technical equipment to avoid technical failures affecting the experience effect and ensure the fluency of immersive experiences.

C. EVALUATION DIMENSIONS AND OPTIMIZATION STRATEGIES OF IMMERSIVE EXPERIENCES

The evaluation of immersive exhibition experiences needs to be carried out from multiple dimensions, and targeted optimization strategies should be formulated based on the evaluation results, as shown in Table 2:

TABLE 2. Evaluation and Optimization Strategies of Immersive Experiences

Evaluation Dimension	Core Measurement Indicators	Optimization Strategies
Participation Degree	Frequency of interactive device use, average participation time, number of participating projects	Optimize interactive design, increase the diversity of interactive projects; reduce participation thresholds and simplify operation processes
Immersion Sense	Audience attention concentration, scene sense of substitution score, technical fluency score	Strengthen multi-sensory collaboration design; optimize the stability of technical equipment and improve image and sound quality
Satisfaction Degree	Overall satisfaction score, content appeal score, experience comfort score	Adjust content design according to audience feedback; optimize exhibition space layout and improve visiting comfort
Cognitive Effect	Information memory accuracy, core content understanding degree, depth of knowledge acquisition	Optimize narrative logic, strengthen the logic and popularity of content; deepen cognition through interaction
Digital Fatigue Level	Audience fatigue feedback score, duration of continuous participation, willingness to re-participate	Control the duration of high-intensity digital interaction; alternate digital and non-digital exhibition sections; simplify technical operation complexity to reduce cognitive load

V. CASE ANALYSIS: PRACTICAL VERIFICATION OF EXHIBITION DESIGN EMPOWERED BY DIGITAL MEDIA TECHNOLOGY

A. PRINCIPLES AND SCOPE OF CASE SELECTION

Cases are selected based on four principles: technical adaptability (extensive application of various digital media technologies), narrative innovation (significant breakthrough in narrative logic), experience immersion (mature immersive experience design), and industry representativeness (covering three core scenarios: museums, science and technology centers, and commercial exhibitions).

Finally, three typical cases are selected: the digital exhibition of the Memorial of the First National Congress of the Communist Party of China, the "Cosmic Exploration" exhibition hall of the Shanghai Science and Technology Museum, and the digital pop-up store exhibition of a brand.

B. IN-DEPTH ANALYSIS OF TYPICAL CASES

1) Case 1: Digital Exhibition of the Memorial of the First National Congress of the Communist Party of China—Integrated Practice of Red Narrative and Immersive Experience

This case mainly adopts technologies such as VR/AR, interactive projection, and surround sound, focusing on the innovation of red cultural narrative and the construction of immersive experiences. In terms of narrative, it breaks away from traditional linear narrative and constructs a multi-act narrative structure through the "Epoch-making Event" immersive theater, allowing audiences to "enter" the historical scene of 1921 and realize cross-temporal red narrative; In terms of experience, it integrates naked-eye 3D, on-site restoration, interactive touch, and other technologies to construct an immersive environment from multi-sensory per-

spectives, and sets up interactive screens for audiences to in-depth understand historical details, improving participation.

2) Case 2: "Cosmic Exploration" Exhibition Hall of the Shanghai Science and Technology Museum—Innovative Practice of Popular Science Narrative and Interactive Experience

This case adopts technologies such as VR, artificial intelligence, and dynamic projection to construct a non-linear popular science narrative framework. Audiences can "land" on the moon and Mars through VR technology to intuitively feel the cosmic environment; The AI system recommends personalized popular science narrative content according to audiences' age and knowledge background, realizing a "one-size-fits-one" popular science experience;

At the same time, it sets up interactive devices such as gravity simulation and planet operation simulation, allowing audiences to deepen their understanding of cosmic knowledge through participation and improve the popular science effect.

3) Case 3: Digital Pop-up Store Exhibition of a Brand—Commercial Practice of Marketing Narrative and Immersive Experience

This case integrates technologies such as big data, AR, and interactive projection to construct a user demand-centered marketing narrative system. It dynamically adjusts exhibition narrative content through big data analysis of target users' interest preferences (e.g., popular fabric styles, weaving techniques); It realizes virtual fabric fitting and pattern customization through AR technology, enhancing the intuitiveness of product experience and supporting audience co-creation (e.g., designing personalized fabric combinations); It sets up interactive photo-taking and content sharing functions to encourage users to participate in narrative communication, realizing the fission spread of marketing narrative.

C. CASE INSIGHTS AND EXTRACTION OF GENERAL LAWS

The core characteristics and insights of the three cases are shown in Table 3, from which the general laws of exhibition design empowered by technology can be extracted:

The general laws mainly include three points:

(1) The core logic of digital enhancement is "technology serves content." All technical applications must focus on narrative and experience needs to avoid "technical gimmicks";

(2) The core of narrative logic innovation is "audience-centricity," realizing the transformation from "designer-led" to "audience participation";

(3) The construction of immersive experiences should focus on multi-sensory collaboration and interactive participation, while accurately matching audience needs in combination with scene characteristics.

VI. CONCLUSIONS AND PROSPECTS

A. CORE RESEARCH CONCLUSIONS

- 1) Digital Media Technology Has Reshaped the Core Dimensions of Exhibition Design Narrative Logic
- Digital media technology has broken the linear, static, and passive narrative limitations of traditional exhibitions, realizing four major transformations: the narrative subject from "designer-led" to "audience co-creation," the narrative structure from "linear" to "non-linear and multi-threaded," the narrative content from "static" to "dynamic and scenarized," and the narrative context from "single physical space" to "virtual-physical integrated cross-temporal space," reshaping the core logic of exhibition narrative.
- 2) Clarified the Construction Paths and Components of Immersive Exhibition Experiences Driven by Technology
- The core components of immersive exhibition experiences include four dimensions: space, content, technology, and users. The construction path needs to follow four principles: multi-sensory collaboration, interactive participation, emotional resonance, and technology integration. In-depth immersive experiences are achieved through multi-technology integration to construct virtual-physical spaces that seamlessly blend tactile textile exhibits with digital overlays, utilizing dynamic interactive content to optimize garment culture dissemination based on user needs.
- 3) Extracted the Collaborative Adaptation Law of Technology, Narrative, and Experience
- The core of the collaboration between the three is "technology serves narrative, narrative supports experience, and experience feeds back the optimization of technology and narrative." Technical applications must match narrative needs, narrative design should focus on experience goals, and technical applications and narrative schemes should be continuously optimized in combination with audience experience feedback to form a virtuous cycle.

B. RESEARCH LIMITATIONS AND FUTURE PROSPECTS

- 1) Research Limitations
- This study has two limitations:
- (1) The scope of case coverage is limited, mainly focusing on three typical domestic scenarios, with insufficient discussion on international cases and niche exhibition scenarios;
- (2) Affected by the dynamics of technological development, the discussion on the application of emerging technologies (such as metaverse and digital twin) is not in-depth enough, and relevant conclusions need to be continuously updated in combination with technological development.
- 2) Future Prospects
- Future research can be carried out in three aspects:
- (1) Expand the scope of cases to include international typical cases and diverse exhibition scenarios, enriching the universality of research conclusions;
- (2) Deepen the research on the application of emerging technologies, exploring the innovative paths of metaverse, digital twin, and other technologies in exhibition narrative and experience construction;
- (3) Strengthen cross-cultural context research, exploring differentiated strategies of technology-empowered exhibition design under different cultural backgrounds, and paying attention to the application of sustainable technologies in exhibition design to realize the coordinated development of ecology and design.

AUTHOR CONTRIBUTIONS

Yingli Xiao designed, collected and analyzed the data, and drafted the manuscript. Yingli Xiao conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Yingli Xiao participated fully in the work, take public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

TABLE 3. Characteristics and Insights of Typical Cases

Case Name	Core Technology Application	Core of Narrative Innovation	Focus of Experience Construction	Core Insights
Memorial of the First National Congress of the Communist Party of China	VR/AR, interactive projection, surround sound	Cross-temporal red narrative, multi-act structure	Historical scene immersion, multi-sensory collaboration	Cultural exhibitions should be based on narrative authenticity, and technology should serve cultural communication; avoid excessive technical display to prevent digital fatigue
Shanghai Science and Technology Museum	VR, artificial intelligence, and dynamic projection	Non-linear popular science narrative, personalized paths	Interactive participation, knowledge visualization	Popular science exhibitions need to balance interestingness and knowledge to enhance the depth of audience participation; clarify the "challenge-skill" balance in interactive tasks
Textile Brand Pop-up Store	Big data, AR, interactive projection	User-oriented marketing narrative, fission communication	Product experience intuitiveness, interactive sharing	Commercial exhibitions should focus on user needs to realize the collaboration between experience and marketing; support true co-creation through modular technical systems

CONFLICTS OF INTEREST

The author declares no conflict of interest.

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