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The More Dazzling the Technology, the Thinner the Culture? A Flow Theory Reflection on the "Superficialization" Dilemma of AR Cultural Tourism and Industry Transformation Pathways

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ABSTRACT

Driven by "technological showmanship," AR cultural tourism experiences exhibit a "superficialization" dilemma characterized by excessive sensory immersion yet insufficient cultural understanding, forming a paradox of "the more immersed in technology, the more alienated from culture." Based on the "challenge-skill balance" framework of Flow Theory and introducing Cognitive Load Theory as an analytical tool, this study diagnoses the flow disruption mechanism caused by cognitive overload and insufficient interaction depth in AR experiences. The findings reveal three interrelated problems in current AR cultural tourism projects: overdevelopment of sensory immersion, superficiality of interaction forms, and absence of meaning construction. The root causes lie in challenge-skill imbalance, alienation of immediate feedback, and the overshadowing of cultural goals by technological goals. Accordingly, this paper proposes three macro-level optimization pathways for the AR cultural tourism industry: constructing a hierarchical narrative system, establishing industry-wide cognitive load regulation standards, and advocating "blank space" design ethics, providing theoretical foundations and strategic references for the transformation of AR cultural tourism from an "attention economy" to an "experience economy."

KEYWORDS

AR Cultural Tourism; Cultural Immersion; Flow Theory; Cognitive Load; Experience Optimization; Industry Transformation.

1. INTRODUCTION

In recent years, driven by policy dividends and technological maturity, AR cultural tourism projects have experienced explosive growth. The integration of digital technology with tourism has become a prevailing trend, with local cultural tourism departments viewing AR technology as a core tool for activating traditional cultural resources and enhancing visitor experiences. AR light shows, AR guides, and AR restoration applications have emerged in endless varieties, becoming standard configurations for cultural tourism integration across regions.

1.1. From "Technological Carnival" to "Cultural Aphasia": The Paradox of AR Cultural Tourism

Taking the "Yanta Liuguang" (Wild Goose Pagoda Light Show) as an example, on-site observations and online reviews reveal that the vast majority of visitors' attention is captured by light and shadow transformations and virtual imagery. Photo-taking, check-ins, and short-video sharing become dominant behaviors, while the historical significance of the Big Wild Goose Pagoda as Xuanzang's

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scripture translation site and a cultural landmark of the Silk Road, as well as the deeper understanding of Tang Dynasty poetry art and the spirit of Buddhism's eastward transmission, are rarely touched upon. After the experience, visitors gain neither knowledge enrichment nor emotional resonance or behavioral transformation. The project becomes a short-lived sensation rather than forming lasting cultural memories.

This "shallow immersion" phenomenon reveals the core paradox of AR cultural tourism: "the more immersed in technology, the more alienated from culture." There is a concerning negative correlation between technological immersion and cultural understanding: the more dazzling the AR interface, the more visitors' attention is captured by technological operations themselves; the richer the interaction forms, the more cognitive resources are consumed by surface-level interactions; the stronger the sensory stimulation, the more space for reflection and meaning construction is compressed. When technology evolves from a tool for cultural presentation into the purpose of the experience itself, AR cultural tourism falls into the trap of technological showmanship.

1.2. Theoretical Perspective: Flow Theory as a Diagnostic Tool

Flow Theory, proposed by Csikszentmihalyi in 1975, describes an optimal experience state when individuals are completely engaged in an activity[1]. The core premise is that when the challenge of an activity balances with an individual's skills, the person enters a highly focused, self-forgetful "flow" state where experience quality is highest and intrinsic motivation is strongest. Key conditions for flow include: clear goals, immediate feedback, challenge-skill balance, action-awareness merging, concentration on the task, sense of control, loss of self-consciousness, and distorted time perception[2].

Flow Theory has been widely applied in tourism research. Kim et al.[3] combined flow experience with telepresence to explore visitor psychological mechanisms in VR concerts. Yu et al.[4] applied the Stimulus-Organism-Response (SOR) model and found that flow experience and telepresence significantly influence consumer purchase intention in short video advertising. In cultural heritage tourism, Cranmer et al.[6] noted that AR technology can enhance visitor experiences through immersive, interactive, and information-rich content, but may also challenge authenticity when virtual content overlays original heritage, potentially weakening object-based authenticity.

However, AR cultural tourism scenarios possess unique characteristics: the technological interface is not a neutral "background" but acts as a "mediator" deeply intervening in the experience process. This mediator may either facilitate flow by enhancing interactivity and enriching feedback channels, or disrupt flow by diverting attention and increasing cognitive load. Fan et al.[8] meta-analysis revealed significant heterogeneity in the impact of immersive technology on tourism experiences, with the match between technological features and content design being the key moderating variable. This study integrates Flow Theory's "challenge-skill balance" framework with Cognitive Load Theory[10] to construct a three-dimensional "challenge-skill-cognition" analytical model.

2. PHENOMENON DIAGNOSIS AND MECHANISM ANALYSIS OF "SUPERFICIALIZATION" IN AR CULTURAL IMMERSION

2.1. Three Manifestations of "Superficialization"

Overdevelopment of Sensory Immersion

Current AR cultural tourism projects generally concentrate technological resources on visual and auditory sensory stimulation, pursuing realistic "immersive" effects while neglecting the deep processing needs of cognitive channels. Visual and auditory channels are saturated with light effects, virtual imagery, and surround sound, leaving no cognitive resources for processing cultural information. Taking "Yanta Liuguang" as an example, the project uses the Big Wild Goose Pagoda

as its core carrier, overlaying massive light projections, virtual flying apsaras, and Tang Dynasty poetry bullet comments through AR technology to create grand visual effects. However, on-site observations show that most visitors' attention is captured by light transformations and virtual imagery, with chasing the best camera angles becoming the dominant behavior. Visitors immerse themselves in sensory pleasure but lose cognitive space for thinking.

This phenomenon echoes Fan et al.[8] meta-analysis findings: immersive technology's impact on tourism experiences shows significant heterogeneity, and when technological features inadequately match content design, technology becomes cognitive interference. Cranmer et al.[6] also noted in cultural heritage tourism research that while AR immersive presentation can enhance immediate visitor engagement, excessive virtual content overlaying original heritage weakens visitors' focus on the cultural heritage itself, leading to technology overshadowing content.

Superficiality of Interaction Forms

AR cultural tourism project interaction design mostly remains at the "stimulus-response" surface level, lacking "problem-solving" mechanisms that promote deep cognitive engagement. In "Yanta Liuguang," visitor interaction is reduced to a standardized workflow from scan-triggering to animation-watching to photo-sharing. The technical system reinforces this surface loop with immediate feedback but fails to design deep interaction segments guiding visitors to actively explore cultural content.

Yu et al.[4] found in studying VR/AR effects on senior tourist experience quality that perceived enjoyment and perceived advantages are key variables driving revisit intention, but this enjoyment mostly stems from technological novelty and operational convenience rather than depth of cultural understanding. In the "Yanta Liuguang" project, visitors' social sharing behavior becomes the main output of the experience, while cultural knowledge acquisition and historical emotional resonance are neglected.

Absence of Meaning Construction

AR cultural tourism projects generally present "what" but fail to explain "why." The "Yanta Liuguang" AR content presents the Big Wild Goose Pagoda's architectural form, light transformations, and virtual flying apsaras, as well as text fragments of Tang Dynasty poetry, but this information is presented in fragmented, tag-based ways lacking historical context and cultural meaning interpretation. Visitors cannot establish meaningful connections with history and culture after the experience.

The absence of meaning construction reduces AR cultural tourism experience to visual consumption rather than cultural immersion with sustained impact. When technology replaces rather than augments cultural interpretation, the experience loses its educational and transformative potential.

2.2. Three Mechanisms of Flow Disruption

Based on the integration of Flow Theory's "challenge-skill balance" framework and Cognitive Load Theory, this study constructs a three-dimensional "challenge-skill-cognition" analytical model to diagnose the flow disruption mechanisms behind "superficialization."

Challenge-Skill Imbalance: Coexistence of Cognitive Overload and Cognitive Underload

The core premise of Flow Theory is the match between challenge level and skill level: when challenge slightly exceeds skill, the individual enters flow state; when challenge far exceeds skill, anxiety arises; when challenge falls far below skill, boredom results. In AR cultural tourism scenarios, "challenge" refers not only to cultural content complexity but also to cognitive demands of technical interaction; "skill" encompasses not only visitors' cultural literacy but also their digital literacy and information processing capabilities.

The "Yanta Liuguang" project simultaneously suffers from dual dilemmas of cognitive overload and cognitive underload. On one hand, AR information density is excessively high, with light effects, virtual flying apsaras, and historical scene restoration flooding multiple channels simultaneously, far exceeding visitors' cognitive capacity (Miller's Law states that human working memory's information unit limit is 7±2[16]). This causes extraneous cognitive load to expand dramatically, squeezing out cognitive resources needed for cultural understanding. On the other hand, culturally literate visitors face diluted content and sacrificed depth, producing cognitive underload—their skill level far exceeds the challenge provided, preventing flow entry and inducing boredom instead. Cheng et al.[11] found in VR art exhibition research that expectation confirmation significantly impacts satisfaction, and expectation formation is closely related to visitors' prior knowledge and skill levels.

Alienation of Immediate Feedback: From "Guiding Deep Engagement" to "Inducing Surface Stay"

Flow Theory emphasizes that immediate feedback is a key condition for maintaining flow state—feedback should help individuals adjust cognitive strategies and progressively deepen engagement. However, in AR cultural tourism projects, immediate feedback often becomes alienated, degenerating from guiding visitors toward deep cultural content to inducing them to remain at surface-level interaction.

The virtual prop collection and leaderboard competition in "Yanta Liuguang" represent typical "alienated feedback." These feedback mechanisms lock visitors' attention at the technical operation level rather than the cultural understanding level. Visitors' sense of achievement comes from the technical system's immediate recognition rather than gradual deepening of cultural cognition. Kim et al.[3] noted in VR concert research that the combination of flow experience and telepresence can enhance visitor engagement, but the quality of this engagement depends on the content and direction of feedback. When feedback points to social sharing rather than personal growth, the flow experience becomes "false flow."

Goal Clarity Deficiency: Technological Goals Overshadowing Cultural Goals

Flow Theory requires clear and explicit activity goals so individuals can concentrate attention on the task itself. In AR cultural tourism scenarios, goal clarity faces dual challenges: the competition between technical operation goals and cultural learning goals. When technical goals are overly explicit while cultural goals remain overly implicit, visitors' attention is captured by technical operations, and cultural understanding becomes an incidental task.

The "Yanta Liuguang" project's design logic reinforces this pattern: entrance guidance, interface prompts, and interaction design all center on technical operations. Visitors are first guided to scan the pagoda to unlock effects, then prompted to watch complete animations and participate in games, and finally induced to share on social media. Throughout this process, cultural learning goals are fragmentarily embedded in technical operation gaps without independent, explicit presentation. Wut et al.[12] noted in systematic reviews of VR/AR tourism research that current studies overemphasize the impact of technical features on experience satisfaction while neglecting the role of experience goal-setting. Khalil et al.[13] also found in museum AR research that when AR experiences lack clear learning goals, visitors' attention is easily diverted by technological novelty.

2.3. Consequences of "Superficialization": Dissipation of Experiential Value

The direct consequence of flow disruption is triple dissipation of experiential value. First, cognitive value dissipation: visitors acquire fragmented, surface-level knowledge that cannot form systematic understanding of Tang Dynasty culture or Silk Road spirit. Second, emotional value dissipation: emotional responses are brief and shallow, with sensory shock failing to transform into lasting cultural identity or place attachment. Third, behavioral value dissipation: post-experience behavioral intention is weak, failing to drive revisits or in-depth exploration of other cultural attractions. Zheng et al.[15]

found in immersive tourism experience research that satisfaction plays a mediating role between visitor engagement and revisit intention. Novak et al.[14] also noted that authentic guest experiences require dual support of emotional engagement and meaning construction.

3. MACRO-LEVEL DEVELOPMENT PATHWAYS FOR AR CULTURAL TOURISM EXPERIENCE OPTIMIZATION

3.1. Constructing Hierarchical Narrative Systems to Address Sensory Immersion Overdevelopment

At the macro level, the AR cultural tourism industry should transform from one-time sensory experiences to hierarchical progressive cultural narratives, establishing a three-layer industry-standard architecture from guidance layer to exploration layer to reflection layer.

The guidance layer's core function is activating prior knowledge and establishing cultural context to lower entry barriers. AR content should not directly present light effects but should use cultural suspense as an entry point, establishing narrative frameworks through short videos, audio guides, or contextualized scenarios. This design follows Tom Dieck et al.[17] proposed AR cultural heritage experience design principles: AR content should serve as a "meaning adder" rather than a "reality replacer."

The exploration layer provides moderate challenges and promotes active discovery. The industry should promote themed branching content architecture: splitting single full-quantity presentation modes into multiple thematic branches where visitors can autonomously choose exploration paths based on interest, with progressive information nodes unfolding from shallow to deep within each branch.

The reflection layer connects personal experience and generates cultural understanding. AR experiences should not stop at information delivery but should set open-ended questions or creative interactions connecting historical culture with contemporary life. Rauschnabel et al.[18] found in studying AR smart glasses acceptance that when technological experiences can stimulate users' self-reflection and meaning construction, perceived value significantly increases.

3.2. Establishing Industry-wide Cognitive Load Regulation Standards to Address Interaction Superficiality

At the macro level, the AR cultural tourism industry should establish "cognitive load regulation" design standards and evaluation systems, following the principles of "moderation, gradation, and adaptability" to precisely control information density and redirect cognitive resources from technical operations toward cultural understanding.

The moderation principle requires establishing technical specifications for information density upper limits. Information units presented at one time should not exceed 7±2 (Miller's Law[16]), and simultaneously presented sensory channels should be controlled within three. Khalil et al.[13] found in museum AR research that when AR interfaces are overly complex, visitor attention is diverted by technical operations, significantly reducing cultural content absorption efficiency.

The gradation principle promotes "modular unlocking" content architecture. AR cultural tourism experiences should be divided into multiple progressive modules, with each module further subdividing information levels. Visitors unlock the next level after completing the current one. Yung et al.[19] noted in VR/AR tourism research reviews that current studies overemphasize technical immersion while neglecting the moderating role of information architecture on experience quality.

The adaptability principle advocates multi-mode choice service design. AR cultural tourism projects should provide quick and deep version switching at the entrance to meet different visitor needs. Yu

et al.[4] found in studying elderly visitors' VR/AR experiences that perceived advantages depend on the match between technical functions and personal needs.

3.3. Advocating "Blank Space" Design Ethics to Address Meaning Construction Deficiency

At the macro level, the AR cultural tourism industry should transform from fill-all design to blank-space design, establishing information blank space, interaction blank space, emotional blank space, and temporal blank space as industry design ethics, preserving space for visitors' autonomous imagination and meaning construction.

Information blank space requires establishing design specifications for interpretive space. AR content should not present complete narratives but should set pauses at key nodes guiding visitors to independently explore or imagine. When telling historical events, at crucial decision points, design pauses that don't directly reveal subsequent plot but prompt visitors: "If you were this historical figure, what choice would you make?"

Interaction blank space promotes open-ended interaction design innovation. AR cultural tourism projects should not preset single answers but should provide multi-path choice interaction spaces. Cranmer et al.[6] noted in cultural heritage tourism research that AR's sustainable value lies in promoting "emotional connection" between visitors and heritage rather than providing standardized knowledge delivery.

Emotional blank space requires abandoning forced sublimation narrative patterns. AR cultural tourism projects should not forcefully point to grand narratives at conclusions but should set silent observation periods, allowing visitors to contemplate before the actual heritage site, forming virtual-real contrast. Tom Dieck et al.[17] noted that the highest state of AR cultural heritage experience is "technology invisibility"—visitors forget technology's existence and directly dialogue with cultural heritage.

Temporal blank space requires establishing silent space standards. AR cultural tourism experiences should not fill all visit time but should set 2-3 silent nodes where all digital content is closed, leaving only environmental lighting for visitors to gaze at the actual heritage site. Fan et al.[8] meta-analysis shows that immersive technology's impact on tourism experiences follows an "inverted U" curve: moderate immersion enhances experience quality, while excessive immersion leads to cognitive fatigue and emotional numbness.

3.4. Synergy Mechanism of Three Pathways and Industry Ecosystem Construction

These three pathways are not isolated but mutually supportive, progressively advancing as an organic whole. The progressive narrative system addresses content architecture issues, cognitive load regulation addresses information presentation issues, and blank space design addresses meaning construction issues. All three point toward one core goal: promoting the AR cultural tourism industry's transformation from technology-driven to culture-driven, from "attention economy" to "experience economy."

Industry ecosystem construction requires coordinated participation from multiple stakeholders. Technology suppliers should shift from feature accumulation to precise adaptation, developing lightweight AR engines and modular content management systems that meet cognitive load regulation standards. Cultural institutions should deeply participate in AR content planning, providing authoritative historical interpretation and cultural explanation to ensure narrative system academic rigor. Tourism operators should establish experience depth operational indicator systems. Policymakers should incorporate cultural understanding and cognitive engagement into AR cultural tourism project review standards and post-evaluation systems.

4. CONCLUSION AND OUTLOOK

4.1. Core Conclusion

This study, based on Flow Theory's "challenge-skill balance" framework and introducing Cognitive Load Theory as an analytical tool, systematically diagnoses the causes and mechanisms of "superficialization" in AR cultural tourism experiences and proposes macro-level optimization pathways for the industry.

The findings reveal that AR cultural tourism's "superficialization" is essentially the suppression of cultural logic by technological logic, manifesting as flow experience disruption. Current AR cultural tourism projects exhibit three interrelated problems: overdevelopment of sensory immersion, superficiality of interaction forms, and absence of meaning construction. The root causes lie in three intertwined mechanisms: challenge-skill imbalance causing coexistence of cognitive overload and cognitive underload, alienated immediate feedback locking visitors' attention at surface-level interaction, and excessive pursuit of technological goals dissolving cultural goals' meaning orientation. These triple mechanisms collectively lead to triple experiential value dissipation: fragmented cognitive value, transient emotional value, and weak behavioral value.

4.2. Theoretical Contributions

This paper's theoretical contributions manifest at three levels. First, it expands Flow Theory from the individual psychological level of "individual skill-challenge matching" to the systematic design level of "cognitive resource allocation in technology-mediated environments." Second, it establishes cognitive load as an antecedent moderating variable of flow experience, enriching Flow Theory's analytical toolkit. Third, through systematic diagnosis of the "superficialization" problem and macro-level construction of industry pathways, it compensates for the limitation of current AR cultural tourism research remaining mostly at the technology acceptance level.

4.3. Practical Implications

This study's findings offer practical implications for three stakeholder groups. For designers: shift from "what technology can do" to "how culture needs to be understood," establishing cultural planning plus technical designer collaborative work models. For managers: shift from project completion to experience deepening, establishing progressive operational rhythms of "initial encounter—deep understanding—resonance." For policymakers: incorporate cultural understanding and cognitive engagement into AR cultural tourism project review standards and post-evaluation systems.

4.4. Limitations and Future Research

This study's limitations mainly manifest at two levels. First, the research methodology primarily relies on theoretical deduction and single-case analysis, lacking multi-case comparison and large-sample empirical testing. The "Yanta Liuguang" case, while representative, may have uniqueness limited by Xi'an's historical and cultural resource endowment and the Datang Everbright City's nighttime economy ecology. Second, flow experience measurement primarily relies on theoretical deduction and behavioral observation without introducing physiological indicators for objective verification.

Future research directions include: first, conducting comparative experimental studies of sensory immersion versus cognitive immersion; second, exploring the integration of artificial intelligence personalized recommendation with Flow Theory; third, extending this study's analytical framework to VR, MR, and other immersive technologies; fourth, focusing on the ethical boundaries of cognitive immersion to avoid historical nihilism or cultural consumerism caused by excessive design.

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