

Article

Configurational Pathways of Digital Technology-Enabled Cultural Experience in Tourism Performing Arts: An fsQCA Study from a Socio-Technical Systems Perspective

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Abstract

Digital technologies are increasingly embedded in tourism performing arts, yet technology-intensive projects do not automatically generate profound cultural experiences. To explain this high-investment-but-low-experience dilemma, this study conceptualizes digital technology-enabled cultural experience as a configurational outcome of technological conditions and visitor-side psychological processing. Drawing primarily on the S-O-R framework and interpreted from a socio-technical systems perspective, digital technology interactivity and innovativeness are treated as stimulus conditions, while cognitive evaluation, scenario construction, and flow experience are treated as organism-level processing conditions. Psychological ownership theory is employed as a supplementary interpretive lens—rather than as a directly measured or tested mechanism—to explain why divergent configurational pathways may converge on high cultural experience through control, intimate understanding, and self-investment. Using fuzzy-set qualitative comparative analysis (fsQCA) with 540 valid questionnaires from visitors to tourism performing arts, the study finds that no single condition is necessary for high cultural experience. Instead, five sufficient configurations are identified: interaction–cognitive compensation, interaction–cognitive–flow synergy, dual-technology traction, innovation–scenario–immersion drive, and innovation–cognitive–flow compensation. The pathway to non-high cultural experience is asymmetric and is mainly characterized by the concurrent absence of technological, cognitive, scenario, and flow conditions. The findings re-specify the application of S-O-R theory in a configurational analytical context and provide a cautious socio-technical explanation of how technological and psychological conditions jointly shape cultural experience.



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1. Introduction

Digital technology has become a key driver of innovation in smart tourism and cultural tourism experiences [1]. Technologies such as virtual reality, augmented reality, artificial intelligence, holographic imaging, and smart interactive devices are shifting tourism experiences from information acquisition and service convenience towards immersive participation, contextual interaction, and value co-creation [2–11]. Tourism performing arts are a particularly appropriate context for examining this transformation because they integrate local history, cultural symbols, stage performance, spatial narrative, audience

participation, and digital media into a composite cultural tourism product [12]. Visitors do not simply watch a show; they enter a culturally meaningful socio-technical environment in which technological affordances, narrative settings, bodily presence, and psychological engagement interact.

However, the practical dilemma of “high investment but low experience” remains salient. Many projects invest heavily in digital screens, projection systems, immersive equipment, and interactive devices, but these technologies do not necessarily produce cultural understanding, emotional resonance, or identity formation. This indicates that the relationship between digital technology and cultural experience is not a simple input-output relationship [13]. Rather, it is a systemic issue: digital technology can support cultural experience only when it is configured with tourists’ cognitive processing, scenario perception, and immersive engagement. From a systems perspective, the key question is therefore not whether a single technological factor has a significant net effect, but how multiple technological and psychological conditions combine to generate high cultural experience.

It should be clarified that this study does not directly measure technological investment, project costs, or investment efficiency. The “high investment but low experience” dilemma is used here as a practical background rather than as a project-level investment-performance variable. The empirical focus of this study is more specific: it examines why the presence of digital technology, as perceived by visitors through interactivity and innovativeness, does not necessarily lead to high cultural experience unless it is combined with visitors’ cognitive evaluation, scenario construction, and flow experience. Thus, the research design translates the practical dilemma into a visitor-experience-level configurational question: under what combinations of technological and psychological conditions can digital technology-enabled cultural experience be formed?

Existing studies have provided important insights into digital technology-enabled tourism experiences, but the literature remains fragmented across several streams [10,14–19]. Research on immersive cultural experiences has shown that sensory immersion, emotional engagement, and visitor participation can enhance tourists’ experiential evaluation and cultural understanding. Studies on digital scenography and technology-mediated performance have further demonstrated how projection, virtual–physical integration, lighting, sound, multimedia presentation, and interactive stage design can reshape theatrical atmosphere and audience perception. In parallel, research on narrative-driven tourism has emphasized the importance of storytelling, place meaning, cultural interpretation, and emotional identification in transforming tourism encounters into meaningful cultural experiences.

However, these streams have not yet been fully integrated in the specific context of tourism performing arts. Tourism performing arts are not merely digital attractions, conventional theater performances, or narrative tourism products. They are live, staged, technologically mediated, and culturally symbolic experience systems in which digital affordances, spatial-narrative settings, performance content, and visitor-side psychological processing interact. Existing studies have often examined technology acceptance, immersive experience, narrative engagement, or visitor satisfaction as separate mechanisms. As a result, less is known about how technological conditions and visitor-side experiential conditions combine to generate high cultural experience.

A further limitation concerns the dominant analytical logic. Many previous studies have used regression-based or structural equation modeling approaches to examine the net effects of individual variables. These approaches are valuable for identifying average relationships and testing directional hypotheses. Nevertheless, they are less able to explain several features that are central to tourism performing arts experiences. First, high cultural experience may be produced by different combinations of technological and psychological

conditions rather than by one universal mechanism. Second, one condition may compensate for the absence of another; for example, strong interactivity and cognitive evaluation may support cultural experience even when scenario construction is not dominant, while innovative technological presentation may become effective when combined with scenario construction and flow. Third, the absence of high cultural experience may not simply mirror the presence of high cultural experience. Therefore, the theoretical gap addressed in this study is not merely the lack of research on tourism performing arts, but the lack of a configurational explanation of how digital technology, narrative-scenic construction, and visitor psychological processing jointly form cultural experience.

To address these limitations, this study uses the S-O-R framework [20], the socio-technical systems perspective, and psychological ownership theory in a differentiated and non-redundant manner. Specifically, the socio-technical systems perspective provides the contextual and analytical lens for understanding tourism performing arts as an experience setting in which digital technologies, cultural narratives, performance spaces, and visitors interact. Within this context, the S-O-R framework serves as the primary analytical model that specifies how external technological stimuli are associated with internal psychological processing and experiential outcomes. Digital technology interactivity (IT) and digital technology innovativeness (IN) are treated as stimulus conditions; cognitive evaluation (CEV), scenario construction (SC), and flow experience (FD) are treated as organism-level psychological processing conditions; and cultural experience (CE) is treated as the response outcome. Psychological ownership theory is not incorporated as an additional model component. Instead, its core mechanisms, control, intimate understanding, and self-investment, are used as a supplementary interpretive lens for explaining why different configurations may lead to high cultural experience. This differentiated theoretical positioning aims to avoid conceptual clutter while retaining the explanatory value of each perspective.

Accordingly, the article is organized around a simple analytical logic: digital technology characteristics provide the stimulus conditions, visitor-side cognitive, contextual, and immersive processing provides the organism-level conditions, and cultural experience represents the outcome to be explained. The socio-technical systems perspective, S-O-R framework, and psychological ownership lens are therefore not treated as parallel theoretical layers, but as differentiated tools serving this analytical sequence.

Existing empirical studies on digital technology and cultural tourism experience have mainly examined whether specific technological or psychological variables exert significant net effects on experience outcomes [21]. Such studies provide useful evidence for understanding the average influence of individual factors, but they are less able to explain how different technological and psychological conditions jointly form sufficient pathways to high cultural experience. In contrast, the present study shifts the analytical focus from net-effect relationships to configurational sufficiency.

The theoretical contributions are threefold. First, this study provides a configurational explanation of digital technology-enabled cultural experience in tourism performing arts by showing that high cultural experience emerges from different combinations of technological and psychological conditions, rather than from any single factor alone. Second, the study contributes to the application of S-O-R theory by treating stimulus and organism-level factors as interdependent set conditions that may combine in multiple sufficient pathways [22]. This does not imply a full theoretical extension of S-O-R theory, but rather a configurational re-specification of its application to complex experience formation. Third, psychological ownership is used as a supplementary interpretive lens to explain the experiential meaning of the identified configurations, particularly in terms of control, intimate understanding, and self-investment, without claiming that psychological ownership is directly measured or empirically mediated.

2. Theoretical Foundation and Analytical Framework

2.1. S-O-R Theory and Cultural Experiences in Tourism Performances

In this study, tourism performing arts refer to composite cultural tourism products that use local history and culture, folk stories, regional symbols, or destination imagery as core content. Through stage performance, spatial storytelling, scenario creation, and digital technology, they provide visitors with cultural understanding, emotional resonance, and immersive experience. Compared with conventional theater performances, tourism performing arts place greater emphasis on the expression of destination culture and the transformation of visitor experience. Compared with typical tourist attractions, they rely more heavily on the integration of narrative structures, performing arts, and digital media. Consequently, cultural experience in tourism performing arts is not merely post-performance satisfaction, entertainment enjoyment, or behavioral intention. In this study, cultural experience refers to visitors' internalized perception of the cultural meaning conveyed by tourism performing arts. It is conceptually delimited to three interrelated aspects: cultural cognition, emotional resonance, and value identification. Cultural cognition refers to visitors' understanding of cultural stories, historical symbols, and local meanings; emotional resonance refers to visitors' affective connection with the cultural atmosphere, narrative, and performance; and value identification refers to visitors' recognition of the cultural spirit and symbolic meaning expressed through the performance. Therefore, cultural experience is treated as a culturally oriented experiential response rather than a general evaluation of performance quality or technological attractiveness.

This clarification also helps position the study in relation to existing research. Prior studies on immersive cultural experiences have mainly emphasized the depth of sensory, emotional, or participatory engagement, while studies on digital scenography have focused more on how technological media reshape performance space and stage perception. Narrative-driven tourism research, by contrast, highlights storytelling, cultural interpretation, and place-based meaning. These perspectives are highly relevant to tourism performing arts, but each tends to privilege a particular aspect of the experience. The present study does not reject these perspectives; rather, it treats them as complementary components of a broader socio-technical experience system. Cultural experience in tourism performing arts emerges when technological presentation, scenario and narrative construction, and visitors' psychological engagement are aligned.

S-O-R theory posits that external environmental stimuli influence individuals' attitudes, behaviors, or experiential responses through internal cognitive and emotional processing [22]. In this study, S-O-R theory is not used to assume a simple linear causal chain from digital technology to cultural experience. Rather, it provides a classificatory framework for distinguishing external technological stimuli, internal psychological processing, and experiential responses. Digital technology may support cultural understanding, emotional resonance, and identity formation only when it works together with visitors' cognitive evaluation, scenario construction, and flow experience. Therefore, the present study does not claim that S-O-R theory is theoretically extended merely by applying fsQCA. Instead, it applies S-O-R as a structured framework for examining how stimulus and organism-level conditions jointly form configurations associated with cultural experience [23,24].

This delimitation is important for the present configurational analysis. Cognitive evaluation, scenario construction, and flow experience are treated as organism-level processing conditions, whereas cultural experience is treated as the response outcome. Although these constructs are related, they do not refer to the same experiential content. Cognitive evaluation concerns visitors' appraisal of digital technology; scenario construction concerns the perceived narrative and spatial context of the performance; and flow experience con-

cerns the psychological state of concentrated immersion. By contrast, cultural experience concerns the extent to which visitors understand, emotionally resonate with, and identify with the cultural meanings conveyed by the performance. This distinction helps prevent cultural experience from becoming an overly inclusive outcome category.

In the context of tourism performing arts, visitors encounter not merely a stage performance, but a composite experiential environment comprising sound and lighting technologies, spatial narratives, interactive media, and cultural symbols [25]. As an external stimulus, digital technology can alter the relationship between visitors and performance content; visitors' cognitive evaluation, scenario construction, and flow experience constitute internal psychological processing; and cultural experience manifests as visitors' understanding of cultural content, emotional engagement, and value identification. Accordingly, this study constructs an analytical framework of digital technology characteristics–multidimensional psychological processing–cultural experience based on S-O-R theory. Within this framework, digital technology interactivity and innovativeness belong to the stimulus level; cognitive evaluation, scenario construction, and flow experience belong to the organism level; and cultural experience belongs to the response level.

The socio-technical systems perspective is reflected analytically in the distinction and combination of two types of conditions. The technical subsystem is represented by digital technology interactivity and digital technology innovativeness, which capture visitors' perceptions of technological affordances and technological novelty. The visitor-side experiential subsystem is represented by cognitive evaluation, scenario construction, and flow experience, which capture visitors' cognitive, contextual, and immersive processing of the performance. The fsQCA model operationalizes the socio-technical perspective by examining whether high cultural experience arises from the alignment between these technical and experiential conditions. In this sense, the study treats cultural experience formation as a configurational issue of socio-technical alignment rather than as a direct effect of technology alone. This operationalization is necessarily limited. The study does not model all possible institutional, organizational, or backstage production elements of a socio-technical system. Rather, it operationalizes the socio-technical perspective at the visitor-experience level by examining how perceived technological affordances and visitor-side experiential processing are configured in relation to cultural experience.

2.2. Characteristics of Digital Technology: Interactivity and Innovation

The interactivity of digital technology (IT) refers to the degree to which visitors engage in real-time feedback, two-way communication and active participation with digital systems, performance content or virtual characters [26]. Unlike traditional static viewing, highly interactive digital technology can grant visitors greater operational autonomy and a sense of control over their experience, transforming them from passive observers into active participants. When visitors are able to influence the course of the experience through selection, triggering, feedback or interaction, their depth of engagement with the cultural content is correspondingly enhanced. The innovativeness of digital technology (IN) refers to visitors' perception of the novelty, creativity and uniqueness of the technological presentation [27]. Innovativeness is manifested not only in the sophistication of the technical equipment, but also in the ability of digital technology to present cultural narratives, create an experiential atmosphere and stimulate visitor interest in novel ways.

In this paper, interactivity and innovation together constitute the core conditions of the digital technology stimulation dimension. The two are not simply parallel concepts: interactivity places greater emphasis on visitor participation and control, whilst innovation emphasizes technological novelty and breakthroughs in cultural expression. Whether these

two elements align with visitors' cognitive processing is the key determinant of whether digital technology can truly be transformed into a cultural experience.

2.3. Cognitive Evaluation: From Technological Acceptance to Cultural Understanding

Cognitive evaluation refers to visitors' technology-focused appraisal of the functional value and operational accessibility of digital technology in tourism performing arts [28]. In this study, it is constructed from perceived usefulness and perceived ease of use, but this does not mean that the two TAM constructs are regarded as theoretically identical [29]. Perceived usefulness concerns whether digital technology helps visitors obtain performance information, understand cultural connotations, and enhance the viewing experience. Perceived ease of use concerns whether the digital technology is clear, smooth, and effortless to operate or understand. Thus, the former emphasizes the perceived value of technology use, whereas the latter emphasizes the perceived cost or effort of technology use.

The decision to combine PU and PEOU into cognitive evaluation is based on the analytical purpose of this study. This paper does not aim to test the internal structure of TAM or the causal relationship between PU and PEOU [14,17]. Rather, it examines how a positive overall appraisal of digital technology, together with scenario construction and flow experience, forms sufficient configurations for high cultural experience. From an fsQCA perspective, CEV is therefore used as a composite set condition that captures whether visitors generally perceive digital technology as both valuable and easy to engage with. Accordingly, CEV is calculated as:

$$\text{CEV} = \text{MEAN}(\text{PU}, \text{PEOU})$$

This composite treatment is also consistent with the set-theoretic purpose of the study. In fsQCA, the aim is not to estimate the separate net effects of PU and PEOU, but to examine whether an overall positive appraisal of digital technology becomes part of sufficient configurations for high cultural experience. Therefore, combining PU and PEOU into CEV helps maintain configurational parsimony while retaining the distinction between perceived value and perceived effort.

This treatment is intended to maintain configurational parsimony while preserving the theoretical meaning of technological cognition. It should not be interpreted as a claim that perceived usefulness and perceived ease of use are conceptually indistinguishable. Instead, both are understood as complementary dimensions of visitors' cognitive appraisal of technology use.

It is also necessary to distinguish cognitive evaluation from scenario construction and flow experience. Cognitive evaluation concerns visitors' judgment of the digital technology itself: whether it is useful, understandable, and supportive of cultural comprehension. Scenario construction concerns the perceived narrative, spatial, cultural, and social context created by the performance environment [30]. Flow experience concerns a psychological state of focused attention, absorption, and reduced awareness of time during the performance. Therefore, although all three conditions are located at the organism level in the S-O-R framework, they represent different aspects of visitor processing: technology appraisal, contextual meaning construction, and immersive attentional engagement. In this sense, cognitive evaluation serves as a rational technology-appraisal link between digital stimuli and cultural experience, rather than as a substitute for scenario immersion or flow [31].

2.4. Scenario Construction: The Contextualized Presentation of Cultural Content

Scenario construction (SC) refers to the process by which tourism performing arts create cultural contexts for visitors that offer a sense of immersion and continuity through

spatial design, narrative organization, visual presentation, and interactive media [16,32,33]. Unlike general technological experiences, the core objective of tourism performing arts is not to make visitors feel that the technology is ‘advanced’, but rather to transport them into a cultural world that is perceptible, comprehensible, and empathetic. The scenario construction items covered in this paper include the presentation of cultural stories, narrative coherence, the integration of historical context, the combination of digital technology and cultural narratives, emotional connection with performers, shared audience reactions, on-site interactive participation, and subsequent interest in cultural exploration. This indicates that SC is not merely a physical environmental variable, but rather a composite experiential condition encompassing cultural narratives, spatial atmosphere, and social interaction.

Digital technology can enhance scenario construction through methods such as the fusion of virtual and real elements, immersive stages, dynamic imagery and interactive storytelling, transforming cultural content from abstract knowledge into embodied experiences. When visitors are transported into specific historical settings, regional cultures or narrative contexts, their perception of cultural content no longer remains at the level of information reception but develops further into emotional engagement and the generation of meaning.

2.5. Flow Experience: From Focused Attention to Cultural Internalization

A flow experience refers to the psychological state of heightened concentration, immersive engagement and diminished sense of time that visitors experience during tourism performing arts [15,34]. Flow experiences reduce visitors’ perception of external distractions, enabling them to focus their attention on the performance content and cultural narrative. In tourism performing arts, the flow experience holds particular significance. It not only signifies that visitors are ‘immersed in the experience’, but also implies that they have developed a high degree of self-engagement during the process. When visitors enter a state of flow, cultural content ceases to be merely an object of observation and instead becomes an integral part of their lived experience. Consequently, the flow experience is a crucial factor in propelling cultural experiences from sensory stimulation towards emotional engagement [35].

To further avoid conceptual overlap, this study distinguishes the three organism-level conditions according to their primary referent and experiential function. Cognitive evaluation is technology-referential: it concerns whether visitors judge the digital technology to be useful and easy to engage with. Scenario construction is context-referential: it concerns whether the performance creates a coherent cultural, narrative, and spatial situation. Flow experience is state-referential: it concerns whether visitors enter a concentrated and immersive psychological state during the performance. These distinctions clarify that the three conditions are not redundant measures of a general positive experience, but analytically different mechanisms through which digital technology-enabled cultural experience may be formed.

2.6. Psychological Ownership as a Supplementary Interpretive Lens

Psychological ownership refers to an individual’s psychological sense that a particular target is “mine” or “related to me” [36,37]. Its formation is generally associated with three routes: a sense of control over the target, intimate familiarity with the target, and self-investment in the target [38–40]. In tourism performing arts, when visitors come to feel that the performance, story, or cultural content is personally relevant or meaningful to them, they are more likely to internalize the cultural experience.

It is important to clarify the role of psychological ownership in this study. Psychological ownership is not operationalized as a separate construct in the fsQCA model, nor is it tested as a direct mediator. Rather, it serves as a supplementary theoretical lens that

informs the post hoc interpretation of the configurational pathways. Specifically, we use the three ownership-generating routes—control, intimate understanding, and self-investment—to explain why different combinations of conditions may converge on the same cultural experience outcome.

Interactivity may activate the control route by allowing visitors to influence their experience. Cognitive evaluation may activate the intimate understanding route by helping visitors comprehend cultural content. Scenario construction and flow experience may activate the self-investment route by drawing visitors into emotional and immersive engagement. This interpretive use of psychological ownership is theoretically useful without introducing the methodological challenges of measuring an additional latent construct. Nevertheless, because psychological ownership is not directly measured, the configurations should not be interpreted as empirical evidence for the mediating effect of psychological ownership. We acknowledge this limitation explicitly in the Section 5.3.

3. Research Design

3.1. Theoretical Framework and Research Model

Based on the theoretical foundation discussed above, this study constructs a configurational analytical framework to examine how digital technology-enabled cultural experience is generated in tourism performing arts. As shown in Figure 1, digital technology interactivity (IT) and digital technology innovativeness (IN) are treated as stimulus-level technological conditions. Cognitive evaluation (CEV), scenario construction (SC), and flow experience (FD) are treated as organism-level experiential processing conditions. Cultural experience (CE) is treated as the outcome condition.

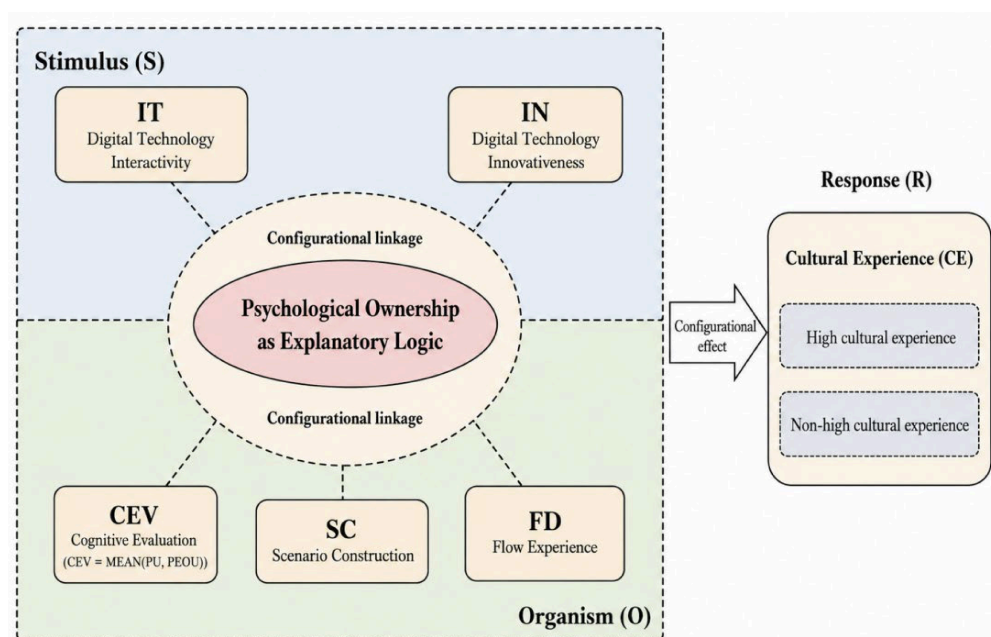


Figure 1. Configurational analytical framework of digital technology-enabled cultural experience in tourism performing arts.

The main configurational model is expressed as follows:

$$IT \times IN \times CEV \times SC \times FD \rightarrow CE$$

This expression does not imply that all five conditions must be present simultaneously. Rather, it indicates that the study examines whether different combinations of technological and experiential conditions constitute sufficient pathways to high cultural experience. The

model does not include psychological ownership as an additional empirical condition. Instead, psychological ownership is used after the configurational results are obtained to interpret how different pathways may activate control, intimate understanding, or self-investment.

To further examine the foundational role of digital technology characteristics, this study additionally constructs a variable for overall digital technology characteristics, DTC, defined as:

$$\text{DTC} = \text{MEAN}(\text{IT}, \text{IN})$$

DTC is used solely for supplementary necessity analysis and does not enter the main configurational model. This avoids variable redundancy with IT and IN while allowing the study to test whether overall digital technology characteristics constitute a necessary condition for high cultural experience.

It should be emphasized that psychological ownership is not treated as a separate empirical condition in Figure 1. Rather, it is positioned as a post hoc interpretive lens for explaining the experiential meaning of the configurations identified through fsQCA.

3.2. Methodological Approach

This study employs fuzzy-set qualitative comparative analysis (fsQCA). The choice of fsQCA is not based simply on the general claim that fsQCA differs from regression or structural equation modeling. Rather, it follows from the specific research question of this study: how do different combinations of technological and visitor-side psychological conditions jointly generate high cultural experience in tourism performing arts? The study does not aim to estimate the independent net effect of each variable. Instead, it examines whether particular constellations of conditions are sufficient for the occurrence of high cultural experience. This does not mean that net-effect models are inappropriate or unimportant; rather, they address a different analytical question. In the present context, a net-effect model may show whether interactivity, innovativeness, scenario construction, or flow experience has a significant average effect, but it cannot directly reveal whether different combinations of these conditions can substitute for one another, whether multiple sufficient pathways exist, or whether non-high cultural experience follows a different causal logic. Based on set theory and Boolean algebra, fsQCA is suitable for examining conjunctural causation, equifinality, and causal asymmetry [41–45]. These features correspond to the empirical phenomenon examined here, where high cultural experience may be produced through multiple socio-technical alignments rather than through one uniform linear mechanism.

The suitability of fsQCA in this study is further supported by three considerations. First, the formation of cultural experience in tourism performing arts exhibits conjunctural causation. Digital technology interactivity, digital technology innovativeness, cognitive evaluation, scenario construction, and flow experience do not operate as isolated antecedents; their experiential effects depend on how they are combined. For example, a visitor may develop high cultural experience when strong interactivity is accompanied by positive cognitive evaluation, even if scenario construction is not the dominant condition. Conversely, another visitor may reach high cultural experience mainly through innovative technological presentation, scenario construction, and flow experience. Second, the phenomenon involves equifinality. Tourism performing arts differ in technological resources, narrative forms, spatial settings, and audience participation modes; therefore, high cultural experience may be generated through more than one sufficient pathway. Third, the relationship between high and non-high cultural experience may be causally asymmetric. The absence of high cultural experience is not necessarily produced by the simple absence of the conditions that generate high cultural experience. These characteristics indicate that the present study requires a configurational approach rather than only a net-effect model.

It should be noted that the use of fsQCA does not deny the continuous and psychometric nature of the measured constructs. Interactivity, innovativeness, cognitive evaluation, scenario construction, and flow experience were first measured and validated as multi-item constructs. Reliability, convergent validity, and discriminant validity were assessed before calibration. The subsequent transformation into fuzzy sets serves a different analytical purpose: it represents the degree to which each case belongs to theoretically meaningful experiential sets, such as high interactivity, high innovativeness, high cognitive evaluation, high scenario construction, and high flow experience. In other words, the variables are not treated as latent constructs for estimating linear net effects, but as calibrated set conditions for identifying sufficient configurations. This treatment is consistent with the configurational logic of the study and allows the analysis to examine whether different degrees of membership in these conditions combine to produce high cultural experience.

3.3. Data Sources and Sample Characteristics

The data were collected through a questionnaire survey of domestic tourists who had attended at least one tourism performing arts performance within the previous six months. To reduce recall bias, respondents were required to evaluate a specific tourism performing arts experience that they had attended within the previous six months. This criterion was intended to ensure that respondents had a concrete and relatively recent experience on which to base their answers. Nevertheless, tourism performing arts vary in performance form, technological sophistication, cultural content, and narrative style. Such heterogeneity may influence visitors' evaluations of digital technology and cultural experience. Therefore, the results should be interpreted as reflecting general configurational patterns across tourism performing arts experiences rather than the characteristics of one specific type of performance. The questionnaire was administered through the Wen Juanxing platform and distributed using a multi-channel convenience sampling strategy. Online distribution was conducted through tourism communities, social media platforms, and relevant forums. Offline distribution was conducted by placing QR codes at exits and rest areas of several popular tourism performing arts venues, inviting visitors who had just completed a performance to participate voluntarily. Data collection took place from 1 October to 7 October 2025. Screening questions required respondents to recall one specific, recent, and impressive tourism performing arts performance and answer all experience-related questions based on that performance.

To ensure data quality, questionnaires completed in less than two minutes were removed based on the pre-test completion time. Attention-check items and reverse-scored questions were included, and responses failing these checks were excluded. Questionnaires showing obvious patterned responses, such as selecting the same option throughout or displaying wave-like response patterns, were also removed. A total of 600 questionnaires were collected, and 540 valid responses remained after data screening, yielding a valid response rate of 90.0%.

Procedural remedies were adopted to reduce common method bias. The questionnaire separated predictor and outcome variables into different sections, assured respondents of anonymity and confidentiality, avoided leading or ambiguous wording, and used expert review and pilot testing to improve item clarity. These procedural controls were supplemented by the statistical tests reported below.

This dataset is related to a prior SEM-based study on digital technology and cultural experience [21]. Unlike that study, which focused on linear net effects and parallel mediation, the present study uses fsQCA to examine configurational sufficiency, equifinality, and causal asymmetry, thereby offering a complementary configurational explanation.

The demographic composition of the sample should be considered when interpreting the configurational findings. As shown in Table 1, respondents aged 35 or below account for 74.1% of the sample, and first-time attendees account for 54.6%. This structure is partly related to the multi-channel convenience sampling strategy used in this study. Visitors who are younger, more active on online platforms, or more willing to scan QR codes at performance venues may have been more likely to participate in the survey. Therefore, the sample may overrepresent visitors who are relatively familiar with digital environments and more responsive to technological novelty, interactivity, and immersive media. This does not invalidate the analysis, because tourism performing arts with digital components often attract visitors who are curious about novel cultural and technological experiences. However, it does suggest that the identified configurations should be interpreted as patterns observed within a relatively young and digitally receptive visitor sample, rather than as universal pathways applicable to all visitor groups.

Table 1. Statistics on Basic Information.

Question Title	Option	Frequency	Percentage (%)
What is your gender?	Male	224	41.5
	Female	316	58.5
Your age?	Under 18	36	6.7
	19–25	189	35.0
	26–35	175	32.4
	36–45	92	17.0
	46 and over	48	8.9
What is your highest level of education (including current studies)?	Secondary school or below	102	18.9
	College diploma	133	24.6
	Bachelor’s degree	211	39.1
	Postgraduate and above	94	17.4
How often do you attend tourism performing arts performances?	First time	295	54.6
	2–3 times	164	30.4
	4 times or more	81	15.0
Total		540	100.0

3.4. Measurement of Variables

The measurement of variables drew on established scales and was adapted to the tourism performing arts context. English scale items were translated into Chinese and back-translated to ensure conceptual equivalence. An expert panel reviewed the content validity, wording, and contextual appropriateness of the items. A pilot test was then conducted with potential tourists from different age groups in Xi’an, and the questionnaire wording was refined based on their feedback. All items were measured on a 5-point Likert scale, where 1 indicates “strongly disagree” and 5 indicates “strongly agree”. The measurement items and corresponding scale sources are summarized in Table 2.

Digital technology interactivity (IT) comprises four items that measure tourists’ perceptions of two-way communication, technological integration, attention capture, and information control, drawing mainly on McMillan and Hwang’s measurement of perceived interactivity [26]. Digital technology innovativeness (IN) comprises three items that measure visitors’ perceptions of the creativity, novelty, and uniqueness of digital technologies, drawing mainly on research concerning hedonic technology acceptance and AR tourism experiences [7,27]. Perceived usefulness (PU) and perceived ease of use (PEOU) each comprise three items, reflecting visitors’ evaluations of the value and ease of use of digital technologies, respectively, and are based primarily on the classic TAM

scale [14,17]. Although PU and PEOU are combined into cognitive evaluation (CEV) in the main fsQCA model, they were measured as separate constructs because they represent two different dimensions of technology acceptance: perceived value and perceived effort. The aggregation was conducted only after reliability and validity assessment, and only for the purpose of constructing a parsimonious cognitive appraisal condition in the configurational model. Therefore, CEV should not be understood as eliminating the theoretical distinction between PU and PEOU, but as representing visitors' overall positive appraisal of digital technology use in this specific fsQCA analysis. Scenario construction (SC) comprises eight items covering cultural narrative, scenario immersion, social participation, and cultural extension, drawing mainly on research on services capes, narrative transportation, and tourism performing arts contexts [16,32,33,46]. Flow experience (FD) comprises five items reflecting visitors' concentration, immersion, sense of control, and diminished sense of time during the performance, drawing primarily on flow theory and the Flow State Scale [15,34]. Cultural experience (CE) comprises five items that measure visitors' culturally oriented experiential response to tourism performing arts. Specifically, the items capture visitors' understanding of cultural stories and historical meanings, perception of local cultural symbols, emotional resonance with the cultural narrative and atmosphere, identification with the cultural spirit expressed in the performance, and the memorability of the cultural meaning conveyed by the experience. These items draw primarily on research related to the experience economy, cultural tourism experience, and memorable tourism experience [47–50]. CE is therefore operationalized as cultural cognition, emotional resonance, and value identification, rather than as general satisfaction, entertainment pleasure, technology evaluation, or behavioral intention. Previous scale development studies also indicate that these items are based on established scales and have been adapted to the tourism performing arts context.

Table 2. Variable Measurement and Scale Sources.

Variable (Abbreviation)	Measurement Items	Main Source
Digital Technology Interactivity (IT)	Two-way communication, technology–performance integration, attention capture, and information control (4 items).	[26]
Digital Technology Innovativeness (IN)	Creativity, novelty, and uniqueness of digital technology in the performance (3 items).	[27]
Cognitive Evaluation: Perceived Usefulness (PU)	Access to performance information, perceived usefulness, and understanding of cultural connotations (3 items).	[14,17]
Cognitive Evaluation: Perceived Ease of Use (PEOU)	Ease of information search, effortless interaction, and clarity of digital presentation (3 items).	[14,17]
Scenario Construction (SC)	Cultural narrative, storyline coherence, historical setting immersion, technology–narrative integration, actor/audience engagement, and extended cultural interest (8 items).	[32,33,46]
Flow Experience (FD)	Challenge–skill balance, automatic involvement, focused attention, sense of control, and time distortion (5 items).	[34]
Cultural Experience (CE)	Emotional resonance, cultural understanding, cultural identity, immersive cultural atmosphere, and Memorability of cultural meaning (5 items).	[47–50]

Note: All items were measured using a 5-point Likert scale, where 1 indicates ‘strongly disagree’ and 5 indicates ‘strongly agree’. In the fsQCA analysis, the cognitive evaluation (CEV) is calculated as the mean of perceived usefulness (PU) and perceived ease of use (PEOU), i.e., $CEV = \text{MEAN}(PU, PEOU)$. The flow experience is represented by FD1–FD5.

3.5. Measurement Quality and Common Method Bias

Before calibration and fsQCA, reliability and validity tests were conducted to ensure that the measurement model provided a sound empirical basis. Cronbach's alpha coef-

ficients for all constructs exceeded the recommended threshold of 0.70, and the overall scale alpha was 0.894, indicating good internal consistency. The reliability analysis results are presented in Table 3. The KMO value was 0.889 and Bartlett's test of sphericity was significant (chi-square = 6761.882, $df = 465$, $p < 0.001$), confirming that the data were suitable for factor analysis. Exploratory factor analysis extracted seven factors with a cumulative explained variance of 63.642%, and all items loaded strongly on their intended constructs. Considering that Harman's single-factor test has limitations, this study further examined common method bias using a full collinearity assessment. The results showed that the variance inflation factor values of all constructs were below the commonly recommended threshold, suggesting that common method bias is unlikely to seriously affect the findings.

Table 3. Reliability analysis results.

Construct	Items	Cronbach's Alpha	Overall Scale Alpha
Digital Technology Interactivity	4	0.816	0.894
Digital Technology Innovativeness	3	0.800	
Perceived Usefulness	3	0.759	
Perceived Ease of Use	3	0.803	
Scenario Construction	8	0.892	
Flow Experience	5	0.843	
Cultural Experience	5	0.836	

Confirmatory factor analysis further supported the measurement model. The CFA fit indices were acceptable (chi-square/ $df = 1.163$, GFI = 0.948, CFI = 0.990, RMSEA = 0.017, IFI = 0.990, NFI = 0.930, PCFI = 0.879). Standardized factor loadings ranged from 0.656 to 0.777. AVE values ranged from 0.507 to 0.577, and CR values ranged from 0.759 to 0.892, indicating adequate convergent validity. Discriminant validity was also supported because the square root of the AVE for each construct was greater than its correlations with other constructs. The convergent validity results are presented in Table 4.

Table 4. Convergent validity results.

Construct	Standardized Loading Range	AVE	CR
Digital Technology Interactivity	0.690–0.771	0.525	0.815
Digital Technology Innovativeness	0.747–0.764	0.573	0.801
Perceived Usefulness	0.687–0.750	0.512	0.759
Perceived Ease of Use	0.736–0.777	0.577	0.804
Scenario Construction	0.656–0.768	0.508	0.892
Flow Experience	0.680–0.772	0.518	0.843
Cultural Experience	0.687–0.738	0.507	0.837

Importantly, PU and PEOU were retained as separate constructs in the measurement quality assessment before being combined into CEV for fsQCA. This procedure ensures that the aggregation of PU and PEOU was not used to obscure measurement problems or conceptual redundancy; rather, the aggregation was introduced after the measurement model had confirmed the reliability, convergent validity, and discriminant validity of the relevant constructs. Therefore, CEV should be understood as a composite set condition for configurational analysis, not as an untested replacement for the original TAM constructs.

Common method bias was examined using Harman's single-factor test. The first unrotated factor accounted for 24.25% of the total variance, which is below the commonly used 50% threshold. Together with the procedural controls described above, this result suggests that common method bias is unlikely to seriously distort the empirical findings.

3.6. Data Calibration

The fsQCA analysis requires raw scale scores to be converted into set membership scores. This study employs the direct calibration method to transform the measured constructs into fuzzy sets. Calibration is a theoretically informed procedure rather than a purely mechanical recoding of Likert-scale scores. In the present study, each calibrated condition represents the degree to which a case belongs to a meaningful experiential set, such as the set of visitors with high perceived interactivity, high perceived innovativeness, high cognitive evaluation, high scenario construction, high flow experience, or high cultural experience.

Because the constructs examined in this study are perceptual and context-specific, there are no universally established external thresholds for determining full membership or full non-membership. Following common practice in fsQCA research, the 95th, 50th, and 5th percentiles of the sample distribution are therefore used as the full membership point, crossover point, and full non-membership point, respectively [41,42]. The 95th percentile identifies cases that strongly belong to a given set, the 50th percentile identifies the point of maximum ambiguity between membership and non-membership, and the 5th percentile identifies cases that are clearly outside the set. This percentile-based strategy is appropriate for perceptual survey data because it preserves relative differences among respondents while avoiding arbitrary use of raw Likert-scale categories as set thresholds. To avoid classification difficulties arising from membership scores exactly equal to 0.5, this study applies a fine-tuning procedure to such values during calibration.

The calibrated variables include digital technology interactivity (IT), digital technology innovativeness (IN), cognitive evaluation (CEV), scenario construction (SC), flow experience (FD), cultural experience (CE), and overall digital technology characteristics (DTC). Among them, IT, IN, CEV, SC, and FD serve as the conditional variables in the main model; CE serves as the outcome variable, and DTC is used solely for supplementary necessity analysis. DTC is excluded from the sufficiency analysis model to avoid conceptual and measurement overlap with IT and IN.

The anchors reported in Table 5 show that higher raw scores correspond to stronger membership in the relevant sets. For example, a higher calibrated score for IT indicates stronger membership in the set of visitors perceiving high digital technology interactivity, while a higher calibrated score for CE indicates stronger membership in the set of visitors reporting high cultural experience. The same logic applies to IN, CEV, SC, FD, and DTC. Therefore, the calibration procedure maintains the substantive direction of the original measurement scales while translating them into set membership scores for configurational analysis.

Table 5. Variable calibration anchors.

Variable Name	Variable Type	Full Membership (i)	Crossover (c)	Full Non-Membership (e)
IT	Predictor	5.000	4.000	1.500
IN	Predictor	4.983	4.000	2.017
CEV	Predictor	4.833	4.167	2.500
SC	Predictor	4.750	4.125	2.000
FD	Predictor	4.800	4.000	2.210
DTC	Supplementary variable	4.706	4.000	2.588
CE	Outcome variable	5.000	4.000	1.610

4. Results of the Configurational Analysis

4.1. Single-Condition Necessity Analysis

Necessity analysis is used to determine whether a single condition constitutes a necessary condition for the outcome. It is generally accepted that when the consistency of a condition reaches 0.90 or above, it can be regarded as a necessary condition for the outcome [41,42]. In this paper, using high cultural experience (CE) and non-high cultural experience (~CE) as outcome variables, we test the necessity of IT, IN, CEV, SC, FD, DTC and their reverse conditions, respectively.

As shown in Table 6, the consistency of all single conditions for both high cultural experience and non-high cultural experience is below 0.90, indicating that no single condition constitutes a necessary condition for either outcome. This suggests that cultural experience in tourism performing arts is not determined by any single factor in isolation but is formed through the combined influence of digital technology characteristics and visitors' psychological processing. It is worth noting that the consistency of IT for high cultural experience is 0.836. Although this value does not meet the standard for a necessary condition, it is relatively high among all conditions. The coverage of DTC for high cultural experience is 0.851, indicating that overall digital technology characteristics are associated with a substantial number of high cultural experience cases. Digital technology is therefore not a necessary condition for cultural experience in isolation but remains a fundamental factor that should not be overlooked in the formation of high cultural experience. In other words, the role of digital technology lies not in determining cultural experience on its own, but in forming effective combinations with cognitive evaluation, scenario construction, and flow experience.

Table 6. Results of Single-Condition Necessity Analysis.

Predictor	CE Consistency	CE Coverage	~CE Consistency	~CE Coverage
IT	0.836	0.780	0.810	0.678
~IT	0.655	0.793	0.738	0.802
IN	0.762	0.808	0.734	0.699
~IN	0.716	0.750	0.798	0.750
CEV	0.725	0.765	0.678	0.642
~CEV	0.660	0.696	0.751	0.710
SC	0.754	0.804	0.739	0.707
~SC	0.726	0.756	0.796	0.743
FD	0.748	0.822	0.738	0.727
~FD	0.752	0.762	0.819	0.745
DTC	0.771	0.851	0.745	0.738
~DTC	0.763	0.770	0.850	0.769

Note: ~ denotes the absence of a condition.

This finding helps explain the “high investment but low experience” dilemma in tourism performing arts practice: investment in digital technology does not necessarily generate profound cultural experience by itself. Only when digital technology characteristics enter visitors' cognitive, contextual, and immersive processes can they be transformed into cultural experience.

4.2. Sufficiency Analysis of High Cultural Experience

Building upon the necessity analysis, this study further constructs a truth table to conduct sufficiency analysis. Given that the sample size is 540, representing a medium-to-large sample, the frequency threshold is set at 3 to ensure that each truth table row included in the analysis is supported by sufficient cases. Meanwhile, the consistency threshold is set at 0.80 and the PRI threshold at 0.65 to minimize contradictory configurations that

simultaneously indicate the presence and absence of the outcome. Regarding directional expectations, and based on the theoretical analysis, IT, IN, CEV, SC, and FD are all set as presence conditions conducive to the formation of high cultural experience. This study uses the intermediate solution as the primary basis for interpretation and combines it with the parsimonious solution to determine core and peripheral conditions.

The overall solution consistency for the five configurations leading to high cultural experience is 0.912, and the overall solution coverage is 0.748. These values indicate that the configurational model has strong explanatory power: the overall consistency exceeds the commonly recommended threshold of 0.80, confirming that the five pathways collectively represent a reliable set of sufficient conditions for high cultural experience. The overall coverage of 0.748 suggests that the five configurations together explain approximately 74.8% of the cases exhibiting high cultural experience, indicating substantial empirical coverage.

For the non-high cultural experience configuration, the overall solution consistency is 0.918 and the overall solution coverage is 0.381. The high consistency confirms the reliability of this single sufficient pathway, while the moderate coverage indicates that this configuration explains a meaningful but not exhaustive portion of non-high cultural experience cases. This is consistent with the causal asymmetry logic of fsQCA: the pathways to non-high cultural experience may be more diverse or context-dependent than the pathways to high cultural experience.

The core and peripheral conditions of each configuration are reported in Table 7. Overall, the five configurations leading to high cultural experience can be grouped into two broader patterns. H1–H3 are interaction-led configurations, in which digital technology interactivity plays a central role either together with cognitive evaluation or together with technological innovativeness. H4–H5 are innovation-led configurations, in which digital technology innovativeness works in combination with scenario construction, cognitive evaluation, or flow experience. The single configuration leading to non-high cultural experience, NH1, reflects the concurrent absence of all five conditions. This pattern further supports the causal asymmetry between high and non-high cultural experience.

Table 7. Configurations Leading to High and Non-High Cultural Experience.

Conditions	H1	H2	H3	H4	H5	NH1
Outcome variable	CE	CE	CE	CE	CE	~CE
Configuration expression	IT*CEV*~SC	IT*CEV*FD	IT*IN*~CEV*~FD	IN*~CEV*SC*FD	IN*CEV*~SC*FD	~IT*~IN*~CEV*~SC*~F
IT	•	•	•			⊗
IN			•	•	•	⊗
CEV	•	•	⊙	⊙	•	⊗
SC	⊙			•	⊙	⊗
FD		•	⊗	•	•	⊗
Cons.	0.926	0.954	0.928	0.939	0.951	0.918
PRI	0.678	0.783	0.665	0.677	0.731	0.691
Raw cov.	0.531	0.563	0.429	0.400	0.426	0.381
Unique cov.	0.036	0.054	0.051	0.022	0.009	-

Notes: • = core condition present; ⊗ = core condition absent; • = peripheral condition present; ⊙ = peripheral condition absent; blank cells indicate that the condition is not specified in the configuration. “~” denotes the absence of a condition. CE = cultural experience; IT = digital technology interactivity; IN = digital technology innovativeness; CEV = cognitive evaluation; SC = scenario construction; FD = flow experience.

To further improve readability, Figure 2 provides a simplified visual summary of the configurations reported in Table 7. H1–H5 represent the pathways leading to high cultural experience, whereas NH1 represents the pathway leading to non-high cultural experience. The figure is intended to show the overall configurational logic rather than to repeat all core and peripheral condition details already presented in Table 7.

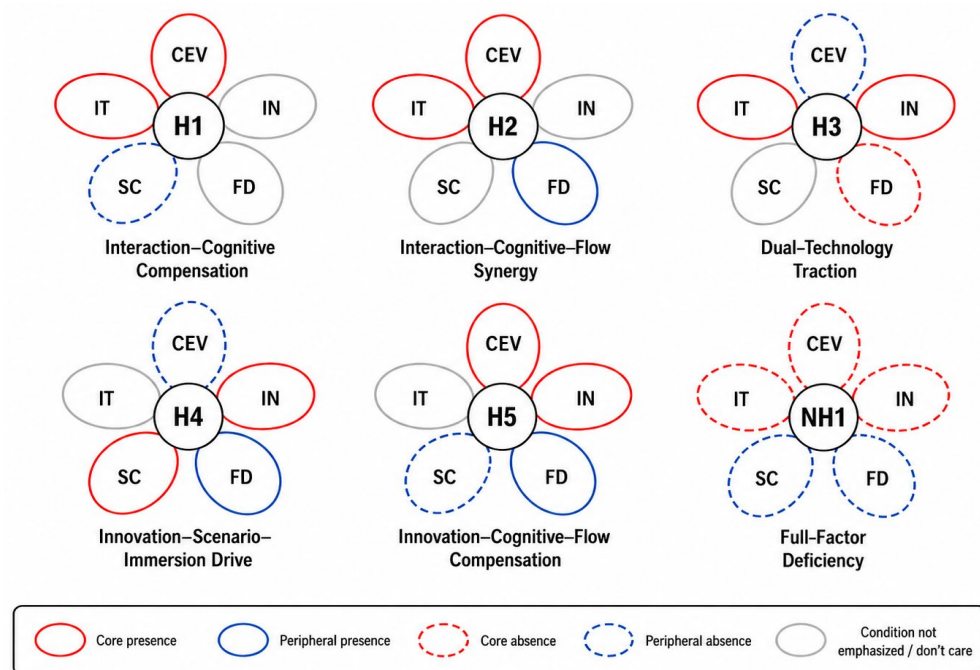


Figure 2. Configurational pathways leading to high and non-high cultural experience in tourism performing arts.

4.2.1. Interaction–Cognitive Compensation Type: $IT*CEV*\sim SC$

Even when scenario construction is relatively insufficient, high digital technology interactivity and high cognitive evaluation can still jointly lead to high cultural experience. The consistency of this pathway is 0.926, and its raw coverage is 0.531, indicating that it has strong explanatory power for high cultural experience.

This result suggests that scenario construction in tourism performing arts is not indispensable under all circumstances. When visitors gain a strong sense of interactive engagement through digital technology and perceive that digital technology helps them understand performance information and cultural content, high cultural experience may still be achieved even when scenario construction is insufficient. The underlying logic is that interactivity enhances visitors' sense of control over the experiential process, while cognitive evaluation reinforces their intimate understanding of cultural content. From the perspective of psychological ownership, this pathway may be interpreted as reflecting the roles of perceived control and intimate understanding, rather than as direct evidence of psychological ownership formation.

4.2.2. Interaction–Cognitive–Flow Synergy Type: $IT*CEV*FD$

H2 indicates that the joint presence of digital technology interactivity, cognitive evaluation, and flow experience is associated with high cultural experience. With a consistency of 0.954 and a raw coverage of 0.563, this pathway is the most empirically representative among the high-experience configurations. Substantively, it reflects a relatively complete combination of technological engagement, cognitive understanding, and immersive involvement. Interactivity may support participation and perceived control, cognitive evaluation may facilitate cultural understanding, and flow experience may strengthen visitors' emotional and attentional engagement. Therefore, this pathway suggests that cultural experience is more likely to be strengthened when participation, understanding, and immersion operate together.

4.2.3. Dual-Technology Traction Type: IT*IN*~CEV*~FD

H3 indicates that, even in the absence of sufficient cognitive evaluation and flow experience, high digital technology interactivity and high digital technology innovativeness may still jointly lead to high cultural experience. The consistency of this pathway is 0.928, and its raw coverage is 0.429. This finding should be interpreted carefully. It does not imply that cognitive evaluation and flow experience are unimportant or that they are entirely absent. Rather, it suggests that, in certain experiential contexts, the technological stimuli themselves may be so intense, novel, and participatory that they generate immediate cultural impressions through a direct stimulus-response mechanism, bypassing the need for extended rational appraisal or sustained immersive absorption.

This interpretation is consistent with the S-O-R framework when understood as a flexible analytical structure rather than a rigid linear sequence. In the original S-O-R formulation, stimuli can influence responses through multiple pathways—some involving elaborate organismic processing and others involving more direct perceptual or affective reactions [22]. In the context of tourism performing arts, H3 captures a scenario in which high-intensity technological stimulation—combining both interactivity (participation and control) and innovativeness (novelty and spectacle)—produces a visceral, immediate, and memorable cultural impression that registers as high cultural experience in visitors' self-reported evaluations.

However, we also acknowledge a boundary condition for this pathway. The cultural experience generated through H3 may be more episodic, sensory, and impressionistic than the deeper cultural internalization associated with pathways involving cognitive evaluation or flow. H3 should therefore be understood as an immediate technology-driven experiential pathway rather than an optimal pathway for deep cultural internalization. For tourism performing arts projects, relying solely on technological novelty and interactive appeal may create a certain level of cultural experience; however, without cognitive understanding and immersive engagement, its sustainability and depth may be relatively limited.

4.2.4. Innovation–Scenario–Immersion-Driven Type: IN*~CEV*SC*FD

H4 indicates that, even in the absence of sufficient cognitive evaluation, high digital technology innovativeness, high scenario construction, and high flow experience can still jointly lead to high cultural experience. The consistency of this pathway is 0.939, and its raw coverage is 0.400. This result suggests that visitors' cultural experience does not necessarily depend solely on clear rational cognitive evaluation. When digital technology is highly innovative and effectively supports scenario construction and immersive experience, visitors can still form a high cultural experience through situational immersion and emotional engagement. In other words, cultural experience in tourism performing arts can be generated through both rational understanding and scenario-based emotional immersion.

This pathway corresponds to the self-investment mechanism in psychological ownership formation. Innovative digital modes of expression enhance the appeal of cultural scenarios; scenario construction provides visitors with a contextual foundation for entering the cultural narrative; and flow experience drives visitors to achieve emotional investment through sustained concentration. The combined action of these three factors enables visitors to form cultural experience through immersive participation, even without strong cognitive evaluation.

4.2.5. Innovation–Cognitive–Flow Compensation Type: IN*CEV*~SC*FD

H5 indicates that, in the absence of sufficient scenario construction, high digital technology innovativeness, high cognitive evaluation, and high flow experience can still jointly

lead to high cultural experience. The consistency of this pathway is 0.951, and its raw coverage is 0.426. This result further demonstrates that, although scenario construction is important, it is not the only pathway to high cultural experience. When digital technology is highly innovative, visitors clearly perceive its usefulness and ease of use, and enter a state of flow during the experience, high cultural experience can still be formed. This pathway shows that technological innovativeness can stimulate interest and novelty, cognitive evaluation can enhance cultural understanding, and flow experience can strengthen emotional engagement. Together, these three factors compensate for insufficient scenario construction.

Compared with H1, the compensatory mechanism in H5 relies more on the innovation–cognition–immersion combination; compared with H2, H5 lacks the interactivity condition but uses innovativeness as the source of technological stimulation. This suggests that, across different project types, digital technology interactivity and innovativeness may play different compensatory roles. This does not negate the importance of scenario construction, but indicates that, under specific combinations of conditions, interactivity, innovativeness, cognitive evaluation, or flow experience can provide a degree of compensation for insufficient scenario construction.

4.3. Configurational Analysis of Non-High Cultural Experience

To further examine causal asymmetry in the formation of cultural experience, this study conducted a configurational analysis using non-high cultural experience ($\sim$ CE) as the outcome variable. The results indicate that, within the current sample and under the set thresholds, the stable non-high cultural experience configuration identified by the software, version 4.1 primarily manifests as the all-factor-deficient type, namely:

$$\sim IT * \sim IN * \sim CEV * \sim SC * \sim FD \rightarrow \sim CE$$

This pathway has a consistency of 0.918, a PRI of 0.691, and raw coverage of 0.381, indicating that when digital technology interactivity, digital technology innovativeness, cognitive evaluation, scenario construction, and flow experience are all absent simultaneously, visitors are more likely to form a non-high cultural experience.

Unlike high cultural experience, which is associated with multiple equivalent pathways, non-high cultural experience exhibits a relatively concentrated pattern of systemic deficiency under the current threshold. This result further illustrates that high and non-high cultural experience do not constitute a simple mirror-image relationship. The formation of high cultural experience can be achieved through various combinations of conditions, whereas non-high cultural experience is more likely to stem from an overall mismatch among technological, cognitive, contextual, and immersive processes. It is therefore evident that the generation of cultural experience in tourism performing arts exhibits distinct causal asymmetry.

It should be noted that this result does not imply that “as long as any one condition is improved, non-high cultural experience will inevitably not occur.” Sufficiency analysis in fsQCA reveals a sufficient relationship between a specific combination of conditions and the outcome, rather than a necessary relationship. In other words, this pathway indicates that the concurrent absence of all five conditions is a stable configuration leading to non-high cultural experience, but it does not rule out other weaker forms of non-high cultural experience or configurations that do not meet the threshold criteria.

The emergence of a single dominant pathway for non-high cultural experience, in contrast to the five equivalent pathways for high cultural experience, is itself an interesting finding. It suggests that the failure of cultural experience is less configurationally diverse than its success. This asymmetry may reflect a threshold effect: when multiple technologi-

cal and psychological conditions are simultaneously absent, visitors are highly likely to experience non-high cultural experience; when at least some conditions are present, the specific combination that produces high cultural experience may vary. This interpretation is consistent with the principle of causal asymmetry that is central to fsQCA.

4.4. Robustness and Sensitivity Analysis

To examine the robustness of the configurational findings, this study conducted two additional tests. First, the PRI consistency threshold was raised from 0.65 to 0.70, and the sufficiency analysis was re-run under this stricter criterion. The results remained substantively stable. The key pathways $IT*CEV*FD$ and $IN*CEV*\sim SC*FD$ continued to appear in the retained solutions, and the key conditions IT, IN, CEV, and FD remained important across the solution terms. For non-high cultural experience, the re-analysis continued to indicate a pattern characterized by the joint absence of multiple technological and psychological conditions. These results suggest that the main conclusions are not driven by a single PRI threshold setting.

Second, to address the possible influence of calibration decisions, a sensitivity analysis was conducted using alternative calibration anchors. Specifically, the original percentile anchors of 95%, 50%, and 5% were compared with an alternative calibration scheme using 90%, 50%, and 10% as the full membership, crossover, and full non-membership points, respectively. The retained configurations were then re-examined under the alternative calibration scheme. The results showed that the main configurational patterns remained substantively stable. The consistency values of the five high-cultural-experience configurations remained above 0.80, ranging from 0.858 to 0.887, and the consistency of the non-high-cultural-experience configuration remained 0.889. Although the raw coverage values changed to some extent, the substantive interpretation of the results did not change. High cultural experience continued to be associated with different socio-technical alignments among technological affordances, cognitive evaluation, scenario construction, and flow experience, while non-high cultural experience continued to reflect the joint absence of multiple technological and psychological conditions. Therefore, the identified configurations are not merely artifacts of a single set of calibration anchors or threshold settings.

The use of percentile-based anchors is appropriate in this study because the focal constructs are visitor-perceived psychological and experiential conditions measured by Likert-type scales, and there are no universally accepted external standards for defining full membership, crossover, and full non-membership in high cultural experience, cognitive evaluation, scenario construction, or flow experience. The 95th percentile identifies respondents with very strong membership in a given condition, the 50th percentile represents the empirical crossover point between membership and non-membership, and the 5th percentile identifies respondents with very weak membership. This approach avoids imposing arbitrary scale-point thresholds and allows calibration to reflect the empirical distribution of visitors' evaluations in the tourism performing arts context.

5. Discussion

5.1. Interpretation and Comparison of the Results

5.1.1. Digital Technology as a Starting Condition in a Socio-Technical Experience System

From a socio-technical systems perspective, the findings indicate that cultural experience is formed through the alignment between technical and experiential conditions. In line with the refined definition of cultural experience, high cultural experience in this study does not refer to a general favorable attitude toward the performance, post-performance satisfaction, or visitors' evaluation of digital technology itself. Rather, it refers to visitors' cultural cognition, emotional resonance, and value identification during the viewing pro-

cess. Digital technology interactivity and innovativeness represent the technical side of the experience system, while cognitive evaluation, scenario construction, and flow experience represent the visitor-side experiential processing. The fsQCA results show that neither side alone is sufficient in all cases. Rather, high cultural experience emerges when technological affordances are configured with visitors' understanding of cultural meanings, contextual immersion in cultural narratives, and psychological engagement with the performance.

The findings show that digital technology interactivity and innovativeness do not constitute necessary conditions on their own. This does not mean that digital technology is unimportant. Rather, it indicates that technology functions as a starting condition in a broader socio-technical experience system. In all five high-cultural-experience configurations, at least one technological condition appears, but its role differs across pathways. In some configurations, interactivity works with cognitive evaluation; in others, innovativeness works with scenario construction and flow experience; and in the dual-technology pathway, both technological conditions compensate for weaker cognitive evaluation and flow. Therefore, the practical problem is not simply whether advanced technology is present, but whether technological affordances are configured with visitors' understanding, scenario immersion, and psychological engagement.

5.1.2. Re-Specifying S-O-R as a Configurational Analytical Framework

The findings should be interpreted within a configurational rather than a purely linear theoretical logic. This finding also responds to the limitations identified in the previous literature. Studies on immersive experience, digital scenography, and narrative tourism have each highlighted important mechanisms through which technology, space, story, and emotion shape visitor experience. However, the present findings suggest that these mechanisms do not operate as isolated or universally ordered factors in tourism performing arts. Instead, cultural experience may arise from different alignments among technological affordances, cognitive appraisal, scenario construction, and flow. The configurational results therefore complement prior linear studies by showing not only whether these factors matter, but how they may work together in alternative sufficient pathways. This study does not argue that digital technology automatically produces cultural experience, nor does it claim to propose a new S-O-R theory. Instead, S-O-R theory is used as a classificatory framework for distinguishing technological stimulus conditions, organism-level psychological processing conditions, and cultural experience as the response outcome.

The configurational results show that these conditions do not operate through a single fixed chain. Digital technology stimuli may be associated with high cultural experience through different combinations with cognitive evaluation, scenario construction, and flow experience. H1 and H2 represent interaction-cognition routes, H4 represents an innovation-scenario-flow route, and H5 represents an innovation-cognition-flow compensatory route. H3 further shows that high-intensity interactivity and innovativeness may generate immediate technology-driven cultural impressions even when cognitive evaluation and flow are insufficient.

The finding that H3 ($IT \times IN \times \sim CEV \times \sim FD$) constitutes a sufficient pathway for high cultural experience warrants particular theoretical attention. At first glance, this configuration appears to challenge the S-O-R assumption that organismic processing mediates the stimulus-response relationship. However, we argue that H3 reflects a stimulus-dominant pathway within the S-O-R framework rather than a violation of it.

In the original formulation, the organismic response to environmental stimuli can vary in its cognitive elaboration [22]. Some stimulus configurations, particularly those combining high novelty (innovativeness) and high interactivity, may elicit relatively direct affective and perceptual responses that do not require extended rational evalua-

tion or sustained attentional absorption to produce meaningful experiential outcomes. In the context of tourism performing arts, visitors encountering highly innovative and highly interactive digital technologies may experience immediate cultural resonance through sensory engagement, perceptual novelty, and a sense of participatory agency, even if they do not consciously evaluate the technology's usefulness or enter a sustained flow state.

This interpretation is further supported by research on hedonic technology acceptance [27], which suggests that in experiential consumption contexts, users' responses to technology are not solely driven by cognitive evaluations but also by affective and sensory reactions. H3 thus represents a legitimate—though perhaps less cognitively elaborated—pathway to cultural experience within the broader S-O-R logic.

The sample profile also provides a useful lens for interpreting the configurational pathways. Because the sample contains a relatively high proportion of younger respondents and first-time attendees, the technology-related conditions may have been especially salient in the formation of cultural experience. Younger visitors may be more accustomed to digital interfaces, interactive media, and immersive technological environments, while first-time attendees may rely more heavily on technological novelty, scenario cues, and immediate immersive engagement when forming their cultural impressions. This may partly explain why configurations involving innovativeness, interactivity, cognitive evaluation, and flow experience play an important role in the results. At the same time, this interpretation requires caution. For repeat visitors, older tourists, or visitors with deeper prior knowledge of the cultural content, cultural experience may depend more strongly on narrative familiarity, cultural interpretation, memory, or comparison with previous performances. Therefore, the configurations identified in this study should be understood as empirically grounded pathways within the present sample, rather than as invariant patterns across all visitor segments.

Therefore, the contribution of this study is not that it theoretically extends S-O-R by using fsQCA, but that it re-specifies the application of S-O-R in a configurational context. The results demonstrate that stimulus and organism-level conditions may be linked through equifinal and asymmetric configurations. This provides a more suitable analytical logic for explaining cultural experience formation in tourism performing arts, where technological affordances, narrative settings, and visitor psychological engagement interact in complex ways.

5.1.3. Mechanisms Underlying Configurational Pathways of Cultural Experience Formation

The five configurations can be interpreted through the three formation routes of psychological ownership—control, intimate understanding, and self-investment—without claiming that psychological ownership is directly measured or empirically tested. Interactivity corresponds to perceived control, cognitive evaluation to intimate understanding of cultural content, and scenario construction together with flow experience to self-investment through narrative and emotional engagement. It is important to reiterate that psychological ownership is not included as a condition or mediator in the fsQCA model. Rather, it serves as a supplementary conceptual vocabulary for explaining why different configurations may render cultural content more personally meaningful to visitors.

5.1.4. Causal Asymmetry and the Failure of Cultural Experience

The configuration for non-high cultural experience is not the simple inverse of the high-experience pathways. Instead, it is primarily characterized by the simultaneous absence of interactivity, innovativeness, cognitive evaluation, scenario construction, and flow experience. This result indicates that cultural experience failure is more likely to occur when

the entire socio-technical system is weak: technology is not engaging, cultural information is not cognitively useful or easy to process, the scenario lacks narrative immersion, and visitors fail to enter a focused psychological state. The finding further confirms the causal asymmetry central to fsQCA and warns managers against assuming that improving one isolated factor will automatically prevent poor experience outcomes.

5.2. Importance and Implications of the Results

The results are important because they show that technology-enabled cultural experience should not be understood as a simple consequence of digital investment. Instead, cultural experience is generated when technological affordances are meaningfully aligned with visitors' cognitive, contextual, and immersive processing. This finding has both theoretical and managerial implications.

5.2.1. Theoretical Implications

First, by identifying five distinct sufficient configurations (H1–H5), this study empirically demonstrates that digital technology-enabled cultural experience arises from multiple socio-technical alignments rather than from any single technological or psychological factor. The findings specify how interactivity and innovativeness become experientially meaningful—not in isolation, but in combination with cognitive evaluation, scenario construction, and flow experience. This configurational evidence complements prior net-effect studies by showing that the same outcome can be reached through different compensatory and synergistic pathways.

Second, this study contributes to the application of S-O-R theory in tourism experience research. Instead of treating S-O-R as a single linear chain, the study applies it as an analytical framework for classifying stimulus, organism, and response conditions in a configurational model. This does not imply a complete theoretical extension of S-O-R theory. Rather, it demonstrates how S-O-R can be used more flexibly to examine equifinality and causal asymmetry in complex cultural tourism experiences.

Third, this study provides a more cautious use of psychological ownership in explaining cultural experience formation. Psychological ownership is not measured or tested as a mediator in this study. Instead, its mechanisms of control, intimate understanding, and self-investment are used as a supplementary interpretive lens for understanding why different configurations may make cultural content more self-relevant and personally meaningful to visitors.

5.2.2. Managerial Implications

The findings also offer several managerial implications, although these implications should be interpreted with appropriate caution. Because this study is based on cross-sectional perceptual survey data, the identified configurations should not be read as experimental evidence that a specific design intervention will necessarily produce high cultural experience. Rather, they provide a diagnostic and reflective framework for understanding how visitors perceive the alignment between digital technology, cognitive evaluation, scenario construction, and immersion in tourism performing arts.

First, tourism performing arts projects may benefit from moving beyond technology-oriented investment toward system-oriented experience design. Digital equipment, projection systems, artificial intelligence, immersive media, and interactive installations should not be evaluated only by their novelty or technical sophistication. More importantly, managers should consider whether these technologies help visitors understand cultural content, enter a coherent narrative scenario, and sustain attention and emotional involvement during the performance. In this sense, the value of digital technology lies not in

technological spectacle itself, but in its capacity to support cultural interpretation and experiential meaning.

Second, the configurational results suggest that managers may adopt differentiated and compensatory design strategies according to the strengths and constraints of specific projects. Projects with strong interactive technologies may emphasize feedback mechanisms, interpretive clarity, and visitor agency, whereas projects with strong visual or creative technologies may focus on narrative coherence, spatial atmosphere, and immersive rhythm. When technological, spatial, or narrative resources are limited, managers may still improve cultural experience by strengthening complementary elements such as cultural explanation, emotional atmosphere, visitor participation, and flow-oriented design. These suggestions should be understood as practical reflections derived from the observed configurations rather than universal design prescriptions.

Third, the configuration associated with non-high cultural experience may serve as a managerial warning signal. The simultaneous weakness of technological interactivity, technological innovativeness, cognitive evaluation, scenario construction, and flow experience suggests that poor cultural experience is not simply caused by the absence of one isolated element. Rather, it may emerge when the entire socio-technical experience system fails to support visitor engagement. Managers should therefore avoid fragmented investments that improve only one visible feature while neglecting cultural interpretation, narrative design, and immersive experience quality.

5.2.3. Societal Implications

Beyond managerial relevance, the findings also have broader implications for cultural preservation, cultural sustainability, heritage interpretation, and destination identity formation. Tourism performing arts are not only commercial entertainment products; they are also cultural media through which local history, regional symbols, collective memory, and destination narratives are presented to visitors. Therefore, the use of digital technology in this context should be evaluated not only by market performance or audience satisfaction, but also by its contribution to the communication and renewal of cultural meaning.

First, the study suggests that digital technology may support cultural preservation when it helps visitors access, understand, and emotionally connect with cultural content. Technologies such as immersive projection, interactive media, virtual–real integration, and intelligent interpretation can make historical stories, local traditions, and symbolic cultural elements more perceptible to contemporary audiences. However, the findings also imply that technology alone is insufficient. If technological presentation is not connected with cognitive explanation, scenario construction, and immersive engagement, it may remain a visual display without deeper cultural significance.

Second, the findings contribute to the discussion of cultural sustainability. Sustainable cultural tourism requires more than the repeated display of heritage resources; it requires the continuous transformation of cultural content into meaningful experiences for different visitor groups. The configurational perspective shows that cultural sustainability may depend on the alignment between technological expression, narrative interpretation, and visitor-side psychological involvement. In this sense, digital technology can contribute to cultural sustainability when it helps cultural content become understandable, emotionally resonant, and personally relevant.

Third, the study highlights the importance of heritage interpretation in digitally mediated tourism performing arts. Cultural experience is more likely to be strengthened when visitors are not merely impressed by technological novelty, but are guided to understand what the performance means, why the represented culture matters, and how the narrative is connected to the destination. This suggests that digital technology should be embedded

within interpretive systems that translate cultural symbols into accessible stories, emotions, and values.

Fourth, the findings are also relevant to destination identity formation. Tourism performing arts often function as symbolic platforms through which destinations present their historical memory, cultural personality, and place-based uniqueness. When digital technologies are aligned with cultural narratives and immersive experiences, they may help visitors form a clearer and more emotionally grounded understanding of the destination. Such experiences can contribute to destination identity by transforming local culture from an abstract background into a lived and memorable visitor experience.

Overall, the societal value of digital technology in tourism performing arts does not lie in replacing cultural content with technological spectacle. Rather, it lies in enabling cultural meanings to be interpreted, experienced, and remembered in ways that support both visitor engagement and the sustainable communication of local culture.

5.3. Limitations and Recommendations

This study has several limitations that also indicate directions for future research. First, the study uses cross-sectional questionnaire data based on visitors' recalled tourism performing arts experiences within the previous six months. Although this requirement helped ensure that respondents evaluated a concrete and relatively recent experience, recall bias cannot be completely avoided. In addition, tourism performing arts differ in performance type, technological sophistication, cultural theme, and narrative structure. These differences may affect how visitors perceive interactivity, innovativeness, scenario construction, flow experience, and cultural experience. Future research could compare different types of tourism performing arts, such as live-action performances, indoor theater productions, theme-park performances, and immersive digital shows, to examine whether the identified configurations remain stable across contexts.

Second, limitations exist regarding sampling and generalizability. This study used a multi-channel convenience sampling strategy through online platforms and QR codes at tourism performing arts venues. Although this approach helped reach respondents who had recent performance experience, it may also have introduced selection bias. The sample is relatively young, with respondents aged 35 or below accounting for 74.1%, and more than half of the respondents were first-time attendees. Such a demographic structure may have shaped the configurational results. Younger visitors and first-time attendees may be more sensitive to technological innovativeness, interactivity, ease of engagement, and immersive flow, whereas older visitors, repeat attendees, or visitors with richer cultural knowledge may form cultural experience through different mechanisms. Therefore, the findings should not be interpreted as fully generalizable to all tourist groups. Future research could use quota sampling, stratified sampling, or multi-site comparative sampling to obtain a more balanced sample. It could also conduct subgroup fsQCA by age, visit frequency, performance type, or digital familiarity to examine whether the identified configurations remain stable across different visitor segments.

Third, although the calibration procedure was made more transparent and sensitivity analysis was conducted, fsQCA results inevitably depend on calibration decisions. In this study, percentile-based anchors were used because the constructs are perceptual and context-specific, and there are no universally established external thresholds for defining full membership or full non-membership. The additional sensitivity analysis using alternative calibration anchors showed that the main configurational patterns remained substantively stable. Nevertheless, calibration remains a methodological choice. Future studies may further validate the configurational findings by using theory-driven external anchors, alternative calibration strategies, or comparative datasets.

Fourth, another limitation concerns the operationalization of the practical problem. Although the study is motivated by the “high investment but low experience” dilemma observed in technology-intensive tourism performing arts projects, it does not include objective indicators of technological investment, project cost, or investment efficiency. The empirical model focuses on visitors’ perceived technological characteristics and psychological processing. Future research could combine visitor-experience data with project-level investment data, operational cost information, or performance evaluation indicators to examine more directly how technological investment is transformed, or fails to be transformed, into cultural experience value.

Fifth, psychological ownership is used as a supplementary interpretive lens rather than as a directly measured construct. Although this positioning helps maintain the parsimony of the fsQCA model, it limits the extent to which this study can make claims about the direct role of psychological ownership. Future research could measure psychological ownership explicitly and examine whether it mediates or conditions the relationship between digital technology configurations and cultural experience.

In addition, although procedural controls, such as Harman’s single-factor test, were used, the study relies on self-reported data collected from the same respondents. Therefore, common method bias and social desirability bias cannot be completely excluded. Future research could combine questionnaire data with behavioral tracking, field observation, interview data, physiological measures, or online review data to validate cultural experience outcomes from multiple sources.

6. Conclusions

Guided primarily by S-O-R theory and interpreted from a socio-technical systems perspective, this study used fsQCA to examine the configurational pathways through which digital technology and visitor-side psychological conditions jointly shape cultural experience in tourism performing arts. In this study, high cultural experience refers specifically to visitors’ cultural cognition, emotional resonance, and value identification, rather than to general satisfaction, entertainment enjoyment, or technology evaluation. The results show that no single condition is necessary for high cultural experience. Instead, high cultural experience is produced through five sufficient configurations: interaction–cognitive compensation, interaction–cognitive–flow synergy, dual-technology traction, innovation–scenario–immersion drive, and innovation–cognitive–flow compensation. The pathway leading to non-high cultural experience is causally asymmetric and is mainly characterized by the concurrent absence of technological, cognitive, scenario, and flow conditions. Overall, the study demonstrates that digital technology-enabled cultural experience is not a linear effect of technology investment, but a socio-technical systems outcome generated by the configuration of technological stimuli and visitors’ psychological processing.

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Institutional Review Board Statement: This study was reviewed and determined to be exempt from ethical review by the Research Ethics Committee of Xi'an University of Architecture and Technology. The exemption was granted because this was an anonymous, non-interventional questionnaire survey that posed minimal risk to participants, did not collect any personally identifiable information, and was conducted with voluntary participation and informed consent.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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