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Research on the impact mechanism of virtual reality interactive perception design on user participation and experience satisfaction in the dissemination of intangible cultural heritage

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Abstract: The dissemination of intangible cultural heritage faces the practical challenge of insufficient effectiveness of traditional models. Although the application of virtual reality technology provides the possibility to solve the dilemma, there are prominent problems that urgently need to clarify the impact mechanism of its interactive perception design on user participation and experience. This study focuses on 356 users who have been exposed to intangible cultural heritage VR products, and constructs an integrated analysis framework that includes direct effects, mediating effects, and moderating effects to systematically explore the impact of VR interactive perception design on user engagement and experience satisfaction. The empirical results indicate that VR interactive perception design has a significant direct positive impact on user engagement and experience satisfaction; Perceived value and technology acceptance play a significant mediating role in the relationship between the two, and the mediating effect of perceived value is stronger than that of technology acceptance; There is a differential moderating effect of user age, intangible cultural heritage awareness level, and VR usage experience on the core impact pathway, while gender has no significant moderating effect. The research conclusion provides practical guidance for optimizing the design of intangible cultural heritage VR products, while enriching the research results of digital technology empowering cultural dissemination.

Keywords: virtual reality; Interactive perception design; Intangible cultural heritage; User engagement; Experience satisfaction

I. Introduction

In the context of the in-depth advancement of China's cultural power construction, intangible cultural heritage, as a living carrier of China's fine traditional culture [1], embodies the collective wisdom accumulated by the nation over thousands of years. It is not only the core bond for maintaining national sentiment, building cultural identity, and demonstrating cultural confidence [2] It has become an important strategic resource for activating new momentum in the cultural industry, empowering rural revitalization, and resisting the erosion of cultural homogenization. Its contemporary value is increasingly prominent in the context of the new era [3].

The report of the 20th National Congress of the Communist Party of China explicitly proposed to "implement the project for the inheritance and development of intangible cultural heritage", and the "14th Five-Year Plan" for cultural development also listed "digital protection and inheritance of intangible cultural heritage" as a key task, pointing out the direction for the dissemination of intangible cultural heritage.

However, under the dual impact of the globalization wave and modernization transformation, the dissemination of intangible cultural heritage is trapped in the realistic paradox of value highlighting and weak inheritance. The interweaving of multiple predicaments has intensified the challenges to its survival [4-5]. At the level of inheritance, the traditional model of oral transmission and personal instruction is facing a survival crisis of "death of people and extinction of art" for many intangible cultural heritage projects such as Kunqu Opera due to the successive passing of veteran artists, the disconnection of the main body of young inheritors, and the continuous decline in the willingness to inherit. The living inheritance chain is on the verge of breaking [6-9]. At the dissemination level, traditional methods are constrained by inherent flaws. They are not only difficult to adapt to the fragmented, interactive and scenario-based information reception habits of Generation Z audiences, but also fail to effectively break through the communication barrier of intangible cultural heritage skills that "can only be understood but not expressed in words". As a result, the recognition and acceptance of intangible cultural heritage among the youth have continued to decline. Trapped in the predicament of "hidden in the deep boudoge and unknown to others" in the circle of communication [10-11]; At the interpretation level, some problems existing in commercial communication, such as superficial

interpretation of cultural connotations, abuse of symbolic meanings, and excessive entertainment transformation, have further dissolved the spiritual core of intangible cultural heritage. Not only has it failed to achieve the construction of cultural identity, but it has also exacerbated the deviation of cultural cognition [12-13].

Against this backdrop, relying solely on traditional models has become difficult to break through the deep-seated predicament of intangible cultural heritage (ICH) dissemination. Digital technology, with its revolutionary dissemination efficiency, has become an inevitable choice for promoting the creative transformation and innovative development of ICH culture and resolving the crisis of inheritance [2-3].

As a cutting-edge breakthrough in the field of digital technology, virtual reality (VR) technology, with its three core features of immersive experience, real-time interactive feedback, and virtual context reconstruction, has broken the communication boundaries of traditional media and formed a deep and innovative coupling with the intrinsic demands of intangible cultural heritage inheritance for "scene-based presentation, interactive experience, and dynamic dissemination". It provides a brand-new possibility for solving the predicament of intangible cultural heritage dissemination [14-16]. As shown in Figure 1, when searching and statistics are conducted in the literature retrieval database with relevant topics as keywords, related research has grown explosively like "bamboo shoots after a spring rain".

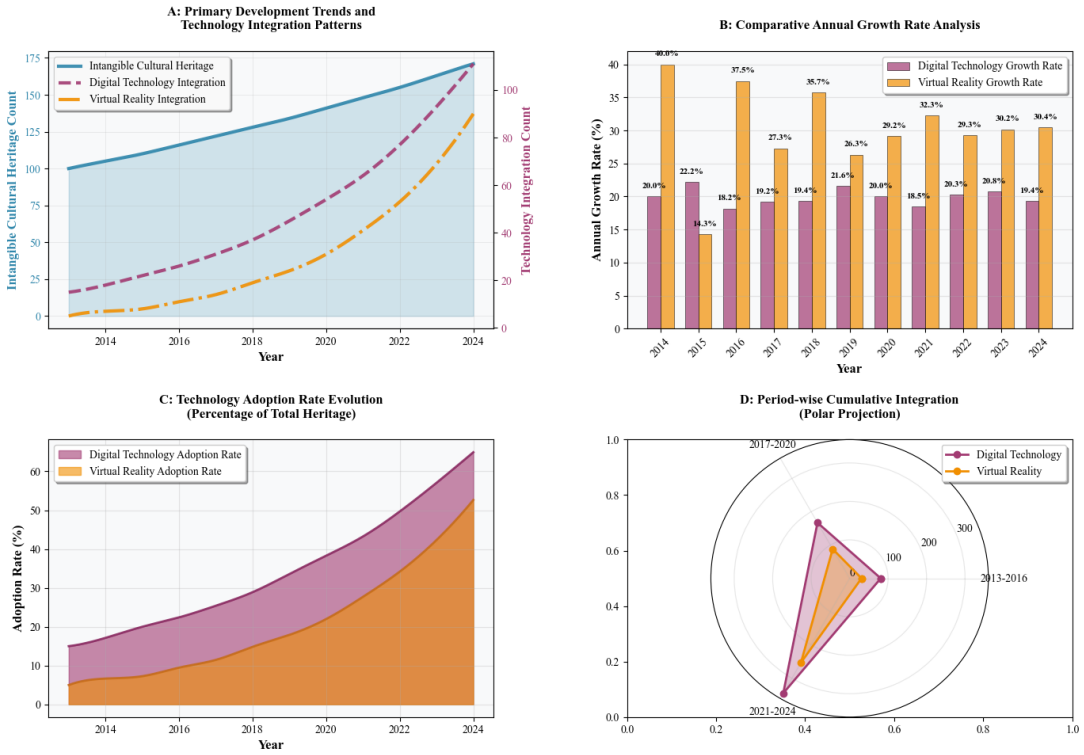

Figure 1 shows the trend in the number of related studies

From the perspective of practical application, VR technology has been initially implemented in projects such as the interactive performance of Kunqu Opera "Peony Pavilion", and its application value has been initially verified. However, it has not yet formed a large-scale dissemination effect [17]. A closer look reveals that the empowerment of VR technology for the dissemination of intangible cultural heritage is not merely a simple accumulation of technologies, but a fundamental transformation of the communication logic. Its immersive feature transforms the abstract process of intangible cultural heritage craftsmanship into an immersive virtual scene, allowing users to directly experience the weight of intangible cultural heritage skills. Its interactive features have overturned the traditional one-way indoctrination model of "I speak and you listen" in communication, granting users the right to participate and achieving a cognitive transformation from "passive acceptance" to "active exploration" and "hands-on practice", effectively deepening users' understanding of intangible cultural heritage skills. Its ability to reconstruct the context can innovate the narrative of intangible cultural heritage symbols, solving the core problem that the cultural connotations of intangible cultural heritage are difficult to be visually presented in traditional communication [15-16].

However, there are still many shortcomings in the current practice of VR dissemination of intangible cultural heritage. Some products overly pursue immersive stimulation at the sensory level while neglecting the in-depth exploration of the cultural connotations of intangible cultural heritage. The interaction logic design of some products is unreasonable, and the learning cost for users is too high, making it difficult to form a continuous willingness to participate. Some products still lack precise adaptation to the needs of different audience groups, resulting in a significant reduction in their communication effectiveness. This practical problem of "technology leading but content lagging behind" and "innovative form but insufficient connotation" urgently requires an in-depth theoretical analysis of the inherent laws of VR interactive perception design to provide scientific guidance for practical optimization. This is precisely the core practical driving force for the conduct of this research.

Although existing research has confirmed the application potential of VR technology in the dissemination of intangible cultural heritage, most of them have focused on the technical implementation path, the description of single cases or the qualitative evaluation of communication effects, lacking a systematic deconstruction of its core support, especially failing to clearly reveal the entire transmission path, resulting in a significant disconnection between theoretical research and practical needs.

Based on this, this study focuses on the influence mechanism of virtual reality interactive perception design on user participation and experience satisfaction in the dissemination of intangible cultural heritage. It takes user participation and experience satisfaction as the explained variables, while introducing perceived value and technical acceptance as mediating variables and individual user traits as moderating variables to construct an integrated analysis framework. This paper systematically deconstructs the chain mediation mechanism between perceived value and technological acceptance, filling the theoretical research gap in the empowerment of intangible cultural heritage dissemination by digital technology. At the same time, it breaks down the research barriers between technical design and humanistic communication, combines the technical characteristics of VR interactive perception with the spiritual connotation of intangible cultural heritage, and enriches the interdisciplinary theoretical achievements in the field of digital cultural communication.

II. Theoretical basis

The core essence of virtual reality interactive perception design lies in constructing

a virtual experience system that conforms to users' perception laws through technical means. Its dimensional architecture is developed around three core dimensions: multimodal interaction construction, spatial presence creation, and user initiative stimulation [18]. Among them, multimodal interaction enhances the sense of interaction reality through the collaborative interaction of multiple senses [19]. The sense of spatial presence determines the depth of immersion through the construction of realistic virtual Spaces [16], while user initiative deepens the experience memory through scientific interaction design [20].

The application of VR design in the field of cultural heritage has undergone a gradual evolution from technological attempts to conceptual upgrades, deepening the understanding of cultural heritage through participatory design. From the perspective of communication studies, there is a fundamental transformation in the collaborative co-creation model that emphasizes the interaction between communication and reception. The core lies in activating the subjectivity of the audience and achieving the dynamic activation of intangible cultural heritage during the dissemination process [21].

User engagement serves as the core indicator for measuring the effectiveness of intangible cultural heritage dissemination. The psychological perspective focuses on revealing the intrinsic psychological motivations of users' participation behaviors during the experience process [22]. The sociological perspective emphasizes the shaping effect of the social attributes of the intangible cultural heritage communication experience on the evaluation results. From the perspective of human-computer interaction, the focus is on adaptability. By analyzing technical variables, it explores the direct impact of technical design on user participation behavior, providing theoretical support at the technical level for design optimization.

Although existing research on VR technology in the field of intangible cultural heritage dissemination has accumulated certain achievements, there are still significant limitations. As shown in Figure 2, at the mechanism research level, most of the existing achievements focus on the qualitative evaluation of VR technology. They lack in-depth deconstruction of the internal mechanism by which VR interactive perception design affects user engagement and fail to clearly reveal the complete transmission path, resulting in obvious gaps in theoretical explanations. At the empirical research level, existing studies lack quantitative analysis based on large sample data, and the persuasiveness of research conclusions is insufficient, making it difficult to effectively guide practical applications. Meanwhile, the existing research has the problem of

disconnection between the exploration at the technical level and the interpretation at the humanistic level, making it difficult to accurately grasp the special demands of the uniqueness of intangible cultural heritage dissemination for VR design.

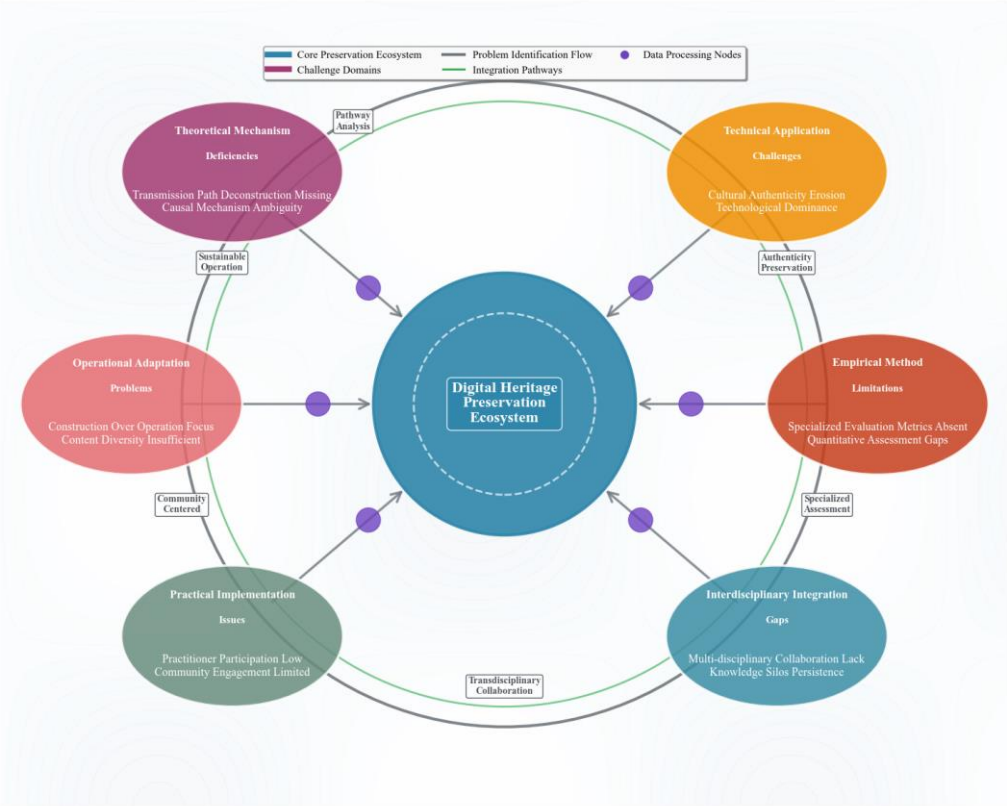

Figure 2 Shows insufficient existing research

III. Research methodology

1. Research design

The research takes VR interactive perception design as the core explanatory variable, and its measurement dimensions cover multimodal interaction, spatial presence, and digital translation of cultural symbols. Taking user engagement and experience satisfaction as the explained variables; Introduce perceived value and technology acceptance as mediating variables and individual user traits as moderating variables to construct an integrated analysis framework.

The questionnaire design is based on existing mature scales and optimizes the items in combination with the characteristics of the VR dissemination scenarios of intangible cultural heritage. All measurement items adopt the 5-point Likert scale (1= strongly disagree, 5= strongly agree). Before the formal research, a pre-research (sample size =50) was conducted, and the ambiguous items were corrected through

reliability and validity tests.

2. Data collection

The research took users who had been exposed to VR communication products for intangible cultural heritage as the survey subjects, and adopted a method of stratified sampling combined with convenience sampling to collect data through multiple channels both online and offline. Distribute electronic questionnaires online through social platforms; Paper questionnaires were distributed in a targeted manner in offline scenarios such as VR experience stores.

A total of 420 questionnaires were distributed in this survey, and 356 valid questionnaires were retrieved, with an effective recovery rate of 84.8%. The samples cover groups of different ages, educational backgrounds, levels of intangible cultural heritage awareness, and VR usage experiences. Among them, 68.3% are young users aged 18 to 35, 76.4% have a bachelor's degree or above, and 69.1% have VR usage experience.

3. Variable Definition

The specific variable definitions in this article are shown in Table 1.

Table 1 Variable Definition Table

Variable Type	Variable Symbol	Variable Name	Dimension Division
Exogenous Variable	VRID	VR Interactive Perception Design	Multimodal Interaction, Spatial Presence, Digital Translation of Cultural Symbols
Mediating Variable	PV	Perceived Value	Functional Value, Emotional Value, Cultural Value
Mediating Variable	TA	Technology Acceptance	Perceived Usefulness, Perceived Ease of Use
Endogenous Variable	UE	User Engagement	Cognitive Engagement, Emotional Engagement, Behavioral Engagement
Endogenous Variable	SS	Satisfaction with Experience	Comprehensive Evaluation
Moderating Variable	UIT	User Individual Traits	Age, Intangible Cultural Heritage Cognition Level, VR Usage Experience

4. Model construction

This study constructs an integrated empirical model that includes direct effects, mediating effects and moderating effects. The mathematical expressions corresponding to each effect are as follows:

(1) Direct effect model

$$UE = \beta_{01} + \beta_{11}VRID + \varepsilon_1 \quad (1)$$
$$SS = \beta_{02} + \beta_{12}VRID + \varepsilon_2 \quad (2)$$

In the formula, β11 represents the direct path coefficient of VRID with respect to UE. β12 represents the direct path coefficient of VRID with respect to SS.

(2) Mediating effect model

The first step is the influence of VRID on mediating variables.

$$PV = \beta_{03} + \beta_{13}VRID + \varepsilon_3 \quad (3)$$
$$TA = \beta_{04} + \beta_{14}VRID + \varepsilon_4 \quad (4)$$

The second step is the influence of mediating variables on endogenous variables.

$$UE = \beta_{05} + \beta_{15}VRID + \beta_{21}PV + \beta_{22}TA + \varepsilon_5 \quad (5)$$
$$SS = \beta_{06} + \beta_{16}VRID + \beta_{23}PV + \beta_{24}TA + \varepsilon_6 \quad (6)$$

In the formula, β13 and β14 respectively represent the path coefficients of VRID with respect to the mediating variables PV and TA. β21 and β22 respectively represent the mediation path coefficients of PV and TA to UE. β23 and β24 respectively represent the mediation path coefficients of PV and TA with respect to SS.

(3) Moderating effect model

The adjustment of the VRId-mediator variable path by the regulating variable.

$$PV = \beta_{07} + \beta_{17}VRID + \beta_{31}UIT + \beta_{41}(VRID \times UIT) + \varepsilon_7 \quad (7)$$
$$TA = \beta_{08} + \beta_{18}VRID + \beta_{32}UIT + \beta_{42}(VRID \times UIT) + \varepsilon_8 \quad (8)$$

The moderating variable's adjustment of the mediating variable - endogenous variable path.

$$UE = \beta_{09} + \beta_{19}VRID + \beta_{25}PV + \beta_{26}TA + \beta_{33}UIT + \beta_{43}(PV \times UIT) + \beta_{44}(TA \times UIT) + \varepsilon_9 \quad (9)$$
$$SS = \beta_{010} + \beta_{110}VRID + \beta_{27}PV + \beta_{28}TA + \beta_{34}UIT + \beta_{45}(PV \times UIT) + \beta_{46}(TA \times UIT) + \varepsilon_{10} \quad (10)$$

In the formula, β41 and β42 represent the adjustment coefficients of UIT for the VRID-PV and VRID-TA paths. β43, β44, β45, and β46 represent the adjustment coefficients of UIT for the PV-UE, TA-UE, PV-SS, and TA-SS paths.

5. Statistical methods

The data processing was carried out using SPSS 26.0 software in the study, and the reliability of the scale was tested by Cronbach'sα coefficient. The structural validity was tested by exploratory factor analysis (EFA). The degree of association between variables was tested through Pearson correlation analysis to preliminarily verify the rationality of the variable relationship. The significance of the mediating effect was tested by using the Bootstrap method (repeated sampling 5,000 times). Through hierarchical regression analysis, the moderating effect of individual user traits on the

core path is examined.

IV. Research findings

1. Reliability and validity test

As shown in Table 2, the Cronbach's α coefficient and CR of each research variable and dimension are all greater than 0.8, and AVE is all greater than 0.5. This indicates that the questionnaire scale used in this research has good internal consistency, and the measurement items can accurately capture the core connotations of each variable.

Table 2 Results of reliability and validity tests

Dimension	Variable Symbol	Number of Items	Cronbach's α Coefficient	CR	AVE	Result
VR Interactive Perception Design	VRID	9	0.912	0.923	0.687	Good
- Multimodal Interaction	-	3	0.876	0.885	0.652	Good
- Spatial Presence	-	3	0.889	0.898	0.674	Good
- Digital Translation of Cultural Symbols	-	3	0.893	0.902	0.668	Good
Perceived Value	PV	6	0.887	0.896	0.671	Good
- Functional Value	-	2	0.821	0.835	0.628	Good
- Emotional Value	-	2	0.834	0.846	0.635	Good
- Cultural Value	-	2	0.847	0.859	0.642	Good
Technology Acceptance	TA	4	0.865	0.878	0.653	Good
- Perceived Usefulness	-	2	0.819	0.832	0.625	Good
- Perceived Ease of Use	-	2	0.828	0.841	0.631	Good
User Engagement	UE	6	0.891	0.903	0.669	Good
- Cognitive Engagement	-	2	0.832	0.845	0.636	Good
- Emotional Engagement	-	2	0.845	0.857	0.643	Good
- Behavioral Engagement	-	2	0.851	0.863	0.648	Good
Satisfaction with Experience	SS	3	0.856	0.872	0.658	Good

2. Descriptive statistics

As shown in Table 3, the mean values of all core variables range from 3.68 to 3.85, showing an overall positive perception trend. This reflects that users hold a positive

attitude towards the interactive design, value perception, participation experience, and satisfaction level of intangible cultural heritage VR products. The absolute values of skew and kurtosis are both less than 1, meeting the prerequisite assumptions of parametric testing methods such as structural equation models.

Table 3 Descriptive statistical results of the main variables

Variable Symbol	Mean	SD	Skewness	Kurtosis	Normality Test Result
VRID	3.82	0.75	-0.42	-0.18	Compliant
PV	3.76	0.78	-0.39	-0.22	Compliant
TA	3.79	0.76	-0.41	-0.19	Compliant
UE	3.68	0.81	-0.35	-0.25	Compliant
SS	3.85	0.73	-0.43	-0.17	Compliant

3. Correlation analysis

As shown in Table 4, all the variables are significantly positively correlated. The correlation intensity among the variables is moderate, and there is no highly correlated situation greater than 0.8. The problem of multicollinearity is excluded, and the rationality of the theoretical relationship among the variables is preliminarily verified.

Table 4 Results of Pearson correlation analysis among Variables

Variable	VRID	PV	TA	UE	SS
VRID	1.00	-	-	-	-
PV	0.68***	1.00	-	-	-
TA	0.65***	0.72***	1.00	-	-
UE	0.62***	0.75***	0.71***	1.00	-
SS	0.64***	0.78***	0.73***	0.76***	1.00

4. Model fit

As shown in Table 5, all the fitting indicators of the structural equation model have reached the ideal standard, and the model setting is reasonable, which can be used for the precise test of the subsequent effect relationship.

Table 5 Fit Index of Structural Equation Model

Fit Indices	Recommended Criteria	Results of This Study
χ^2/df	1-3	2.36
Goodness of Fit Index (GFI)	>0.90	0.91
Adjusted Goodness of Fit Index (AGFI)	>0.85	0.88
Normed Fit Index (NFI)	>0.90	0.92
Comparative Fit Index (CFI)	>0.90	0.94
Root Mean Square Error of Approximation (RMSEA)	<0.08	0.065

5. Direct effect test

As shown in Table 6, the multi-modal interaction optimization, spatial presence creation and digital translation of cultural symbols of intangible cultural heritage VR products can directly enhance the depth of user participation at the cognitive, emotional and behavioral levels, and at the same time improve the overall experience satisfaction evaluation of users, highlighting the direct value of interactive perception design as the core handle of technology empowerment.

Table 6 Direct Effect Test Results

Hypothesized Paths	β	SE	t-value	p-value
VRID → UE	0.28	0.042	6.67	***p<0.001
VRID → SS	0.25	0.045	5.56	***p<0.001

6. Mediating effect test

As shown in Table 7, both PV and TA play significant mediating roles. It indicates that users' perception of the value of intangible cultural heritage VR products is a more core transmission path for the transformation of technical design into a good experience, while technical acceptance constitutes a fundamental supporting intermediary.

Table 7 Results of Mediating Effect Test (Bootstrap method, Repeated sampling 5,000 times)

Mediating Paths	Indirect Effect Value	Standard Error (SE)	95% Confidence Interval	p-value
VRID → PV → UE	0.23	0.038	[0.157, 0.303]	***p<0.001
VRID → PV → SS	0.21	0.036	[0.141, 0.279]	***p<0.001
VRID → TA → UE	0.18	0.032	[0.118, 0.242]	***p<0.001
VRID → TA → SS	0.16	0.030	[0.102, 0.218]	***p<0.001
Total Mediating Effect (VRID→UE)	0.41	0.045	[0.322, 0.498]	***p<0.001
Total Mediating Effect (VRID→SS)	0.37	0.042	[0.288, 0.452]	***p<0.001

7. Moderating effect test

As shown in Table 8, individual user traits have differentiated moderations on the core path, and young users are more sensitive to the value perception of VR interactive design. Users with a high awareness of intangible cultural heritage are more likely to perceive the cultural value in the design and transform it into in-depth participation. Experienced VR users pay more attention to the ease of interaction, and their acceptance has a more obvious impact on satisfaction. The gender moderating effect is not significant, indicating that the core path relationship has transgender stability.

Table 8 Results of the moderating effect test

Moderating	Dimensions of	β	Standard	t-	p-value	Result Judgment

Paths	Moderating Variable		Error (SE)	value		
VRID → PV	Age	-0.15	0.062	-2.42	*p<0.05	Significant Negative Moderation
VRID → PV	ICH Cognition Level	0.18	0.065	2.77	**p<0.01	Significant Positive Moderation
VRID → TA	VR Usage Experience	0.14	0.061	2.30	*p<0.05	Significant Positive Moderation
PV → UE	ICH Cognition Level	0.16	0.063	2.54	*p<0.05	Significant Positive Moderation
TA → SS	VR Usage Experience	0.12	0.058	2.07	*p<0.05	Significant Positive Moderation
VRID → UE	Gender	-0.08	0.059	-1.36	p>0.05	Non-significant Moderation Effect

V. Conclusion

This study takes users of VR products for intangible cultural heritage as the research objects. By constructing an integrated analysis model, it systematically reveals the influence mechanism of virtual reality interactive perception design on user participation and experience satisfaction in the dissemination of intangible cultural heritage. Empirical results show that VR interactive perception design can directly and positively enhance user engagement depth and experience evaluation. Perceived value and technological acceptance play a significant mediating role in the relationship between the two, and the transmission efficiency of perceived value is more prominent. Among them, the digital translation of cultural connotations has a more crucial transformation effect on user experience. Individual user traits show differentiated moderating effects. Young users are more sensitive to the value perception of interactive design. Users with a high level of awareness of intangible cultural heritage are more likely to transform their perception of cultural value into in-depth participation. Experienced VR users pay more attention to the ease of interaction and its impact on satisfaction. However, gender has no significant moderating effect on the core path, providing a precise basis for differentiated product design.

Theoretically, this study fills the gap in the research on the mechanism of digital technology empowering the dissemination of intangible cultural heritage, breaks down the disciplinary barriers between technical research and humanistic communication, and enriches the interdisciplinary theoretical achievements in the field of digital cultural dissemination.

At the practical level, this study addresses the current pain point of intangible cultural heritage VR products, which emphasizes technical form over cultural connotation, and proposes three core optimization directions. First, enhance the quality of digital translation of cultural symbols to avoid experience distortion caused by technological accumulation. Second, implement differentiated design based on user characteristics; Thirdly, establish the design principle of "value perception first", and simultaneously integrate the design for the transmission of functional value, emotional value and cultural value during the technical development stage. In addition, relevant institutions can establish evaluation standards for VR products of intangible cultural heritage based on the conclusions of this research, promoting the transformation of the industry from "technology-driven" to "experience and value-driven", and facilitating the dynamic inheritance of intangible cultural heritage in the digital age.

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Appendix

Questionnaire on the Impact of VR Interactive Perception Design on Intangible Cultural Heritage Communication

Instructions

Dear participants, this questionnaire is part of an academic research on "The Impact Mechanism of Virtual Reality Interactive Perception Design on User Engagement and Satisfaction in Intangible Cultural Heritage (ICH) Communication". Your answers are crucial for our research conclusions.

The questionnaire will take about 5-8 minutes to complete. All data will be used for academic research only and strictly kept confidential. Please answer truthfully based on your actual experience of using VR products for ICH communication.

For each question below, please select the option that best matches your actual situation. The 5-point Likert scale is defined as follows: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Thank you for your support and cooperation!

Part 1: Demographic Information

Gender:

☐ 1. Male ☐ 2. Female

Age:

☐ 1. Under 18 ☐ 2. 18-25 ☐ 3. 26-35 ☐ 4. 36-45 ☐ 5. Over 45

Education Level:

☐ 1. High school and below ☐ 2. College diploma ☐ 3. Bachelor's degree ☐ 4. Master's degree and above

ICH Cognition Level:

☐ 1. Very little understanding ☐ 2. Little understanding ☐ 3. General understanding ☐ 4. Good understanding ☐ 5. Very good understanding

VR Usage Experience:

☐ 1. No experience ☐ 2. Once ☐ 3. Several times ☐ 4. Frequently ☐ 5. Very frequently

Part 2: VR Interactive Perception Design (VRID)

Please rate your experience of VR ICH products based on the following statements:

Questions 1 2 3 4 5

1. The VR product provides rich sensory experiences (vision, hearing, touch, etc.) during ICH interaction. ☐ ☐ ☐ ☐ ☐

2. The interaction methods of the VR product (e.g., operation, feedback) are diverse and natural. ☐ ☐ ☐ ☐ ☐

3. The multi-sensory collaboration of the VR product effectively enhances the authenticity of ICH experience. ☐ ☐ ☐ ☐ ☐

4. The virtual scene of the VR product makes me feel "being on the spot" when experiencing ICH. ☐ ☐ ☐ ☐ ☐

5. The sensory feedback of the VR product is timely and consistent with the virtual ICH scene. ☐ ☐ ☐ ☐ ☐

6. The construction of the virtual space in the VR product deeply immerses me in the ICH experience. ☐ ☐ ☐ ☐ ☐

7. The VR product accurately translates core ICH cultural symbols into digital forms. ☐ ☐ ☐ ☐ ☐

8. The digital presentation of ICH craftsmanship and connotations in the VR product is vivid and easy to understand. ☐ ☐ ☐ ☐ ☐

9. The VR product effectively conveys the spiritual connotation of ICH through digital translation. ☐ ☐ ☐ ☐ ☐

Part 3: Perceived Value (PV)

Please rate your subjective perception of VR ICH products based on the following statements:

Questions 1 2 3 4 5

1. Using the VR product helps me efficiently understand ICH knowledge and skills. ☐ ☐ ☐ ☐ ☐

2. The VR product meets my practical needs for ICH experience and learning. ☐ ☐ ☐ ☐ ☐

3. The VR product brings me positive emotional experiences (e.g., joy, touch) during ICH interaction. ☐ ☐ ☐ ☐ ☐

4. The VR product enhances my emotional connection with ICH. ☐ ☐ ☐ ☐ ☐

5. The VR product helps me better perceive the cultural value and significance of ICH. ☐ ☐ ☐ ☐ ☐

6. The VR product strengthens my recognition of ICH's cultural connotation. ☐ ☐ ☐ ☐ ☐

Part 4: Technology Acceptance (TA)

Please rate your evaluation of VR ICH products based on the following statements:

Questions 1 2 3 4 5

1. Using the VR product is helpful for me to obtain valuable ICH information and experiences. ☐ ☐ ☐ ☐ ☐

2. The VR product is useful for improving my understanding of ICH. ☐ ☐ ☐ ☐ ☐

3. The operation of the VR product is simple and easy to learn. ☐ ☐ ☐ ☐ ☐

4. I can smoothly use the VR product to experience ICH without excessive learning costs. ☐ ☐ ☐ ☐ ☐

Part 5: User Engagement (UE)

Please rate your performance during the experience of VR ICH products based on the following statements:

Questions 1 2 3 4 5

1. I actively focus on and think about the ICH knowledge and content presented in the VR product. ☐ ☐ ☐ ☐ ☐

2. I am willing to take the initiative to learn more ICH-related knowledge through the VR product. ☐ ☐ ☐ ☐ ☐

3. I have a strong emotional resonance with the ICH culture presented in the VR product. ☐ ☐ ☐ ☐ ☐

4. I am emotionally invested in the ICH experience process of the VR product. ☐ ☐ ☐ ☐ ☐

5. I am willing to share my experience of the VR ICH product with others. ☐ ☐ ☐ ☐ ☐

6. I am willing to use the VR ICH product repeatedly or participate in other ICH activities. ☐ ☐ ☐ ☐ ☐

Part 6: Satisfaction with Experience (SS)

Please rate your overall satisfaction with VR ICH products based on the following statements:

Questions 1 2 3 4 5

1. I am very satisfied with the overall experience of the VR ICH product. ☐ ☐ ☐ ☐ ☐

2. The VR ICH product meets or exceeds my expectations for ICH digital experience. ☐ ☐ ☐ ☐ ☐

3. I would recommend the VR ICH product to friends or relatives interested in ICH. ☐ ☐ ☐ ☐ ☐

Thank You!

Your participation has greatly supported our research. If you want to know the research results, you can leave your email address below (optional):

Email Address: _____