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RESEARCH ARTICLE

A Spatial Design Framework for Wing Chun Interactive Art Installations Based on Grounded Theory

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ABSTRACT

This study aims to construct a design framework for Wing Chun interactive art installations using grounded theory to enhance user experience and promote the transmission of Wing Chun culture. The research background highlights the challenges faced in traditional cultural heritage, particularly the decline of Wing Chun techniques and the lack of successors. Through in-depth interviews, feedback was collected from young users, installation operators, and Wing Chun inheritors. The data were analyzed using grounded theory's open coding, axial coding, and selective coding methods. The findings indicate that four dimensions—material space, spiritual space, social space, and commercial space—significantly impact user experience and cultural transmission. This study proposes specific optimization strategies to enhance the educational value and cultural influence of the interactive art installation, fostering the sustainable development of Wing Chun culture. The research results offer new perspectives and methods for the preservation of Wing Chun heritage, providing important theoretical and practical implications.

INTRODUCTION

With globalization and the transformation of modern lifestyles, the transmission and development of traditional culture face numerous challenges. Wing Chun, as a significant intangible cultural heritage, is also confronted with issues such as a lack of successors and the potential loss of its techniques. Against this backdrop, interactive art installations, as an emerging fusion of technology and art, offer new perspectives and methods for the preservation and transmission of Wing Chun.

1. LITERATURE REVIEW

As an emerging form that integrates technology and art, interactive art installations provide an innovative approach to disseminating traditional martial arts culture. Utilizing sensors, artificial intelligence, projection mapping, and virtual reality, these installations enable real-time interaction with audiences, thereby offering an immersive experience (Chen & Ibrahim, 2023). Shen et al. (2022) proposed a sound-based interactive design model that enhances the experience of traditional Guqin culture through interactive sound installations. Similarly, Zhou & Zhang et al. (2023) focused on employing artificial intelligence to recreate the experience of Chinese literati paintings, emphasizing the importance of interactive participation in cultural heritage preservation. Bianconi et al. (2023) explored the application of historical 3D visualization and interactive installations in cultural

heritage visualization, aiming to preserve and support regional cultural memory through the analysis and evaluation of existing heritage. Building on these advancements, Li et al. (2024) implemented an AI-driven real-time interactive art installation to recreate Silk Road culture, providing users with an immersive experience that allows them to engage with cultural heritage in a more interactive and dynamic manner.

Manovich (2001) argued that interactive installations enable audience participation to influence the form of artistic expression, adding new dimensions to artistic creation. In the field of cultural dissemination, Peppler (2013) highlighted the extensive application of interactive art installations in visual arts, museums, and cultural heritage preservation, underscoring their potential impact. In recent years, interactive art installations have demonstrated significant success in the dissemination of martial arts culture. Knudsen (2010) suggested that interactive installations can showcase the essence of martial arts through dynamic experiences, enhancing audience interest and understanding. A successful example of this approach is the "Kung Fu City" project in Hong Kong, which utilizes interactive installations to attract tourists while deepening public awareness of the cultural background of martial arts (South China Morning Post, 2024).

The development of interactive art installations is supported by theoretical foundations. Mixed reality and augmented reality technologies serve as their technical backbone, with Milgram and Kishino (1994) providing a detailed explanation of the levels of mixed reality, offering a theoretical framework for interactive installation design. Additionally, Manovich (2001) explored the language of digital media, further advancing research on the relationship between interactive installations, audiences, and their environments. Regarding interaction design, Salen and Zimmerman (2003) introduced gamification principles that form the foundation for effective engagement between audiences and installations. Studies have also shown that well-designed user experiences can significantly enhance interaction effects (Heibeck, Hope, & Legault, 2014). Ryan (2012) noted that digital media technologies are increasingly integrated into everyday life.

The role of interactive art installations in intangible cultural heritage transmission has been widely recognized. Ding & Guo (2023) pointed out that interactive installation art, as an organic combination of new media technology and art, transcends spatial limitations and traditional media constraints, enabling unique interactive experiences and promoting the development of the cultural industry. Furthermore, Gieseking and Mangold (2014) proposed that interactions between space and individuals strengthen cultural transmission, providing an important theoretical basis for the dissemination of martial arts culture.

However, existing studies on Wing Chun interactive art installations still present several limitations. First, in terms of technological application, although virtual reality (VR) and sensor-based technologies have been explored, their application remains superficial and lacks depth and systematic integration. For example, VR technology has primarily been used for simple motion demonstrations without fully leveraging its potential for immersive experiences and interactivity. Second, user experience design has largely focused on singular interactive methods, such as gesture recognition or motion capture, without adequately addressing users' emotional, cognitive, and social needs. This lack of diversified interaction and feedback mechanisms limits deep engagement between users and installations, reducing both participation and satisfaction.

Regarding cultural content development, existing studies have primarily concentrated on surface-level displays of techniques and historical introductions, failing to delve into the philosophical foundations, regional cultural aspects, and spiritual essence of Wing Chun. This superficial cultural presentation and lack of systematic content design hinder the potential of interactive art installations in cultural transmission and education. Lastly, in terms of sustainability, existing studies have overlooked long-term operational and maintenance mechanisms for Wing Chun interactive art

installations. While some installations initially attract users, interest gradually declines over time, leading to a decrease in their appeal and overall impact.

In summary, existing research on Wing Chun interactive art installations faces multiple challenges in technological application, user experience design, cultural content development, and sustainability. These limitations not only constrain the potential of interactive art installations in enhancing user experience and cultural transmission but also hinder the deep dissemination and sustainable development of Wing Chun culture. Therefore, this study aims to explore and innovate in these areas, maximizing the role of modern technology in traditional cultural preservation and transmission while promoting the sustainable development of Wing Chun culture.

2. RESEARCH DESIGN

2.1 Data Collection

Currently, there are no established theoretical assumptions or validated measurement scales available for examining the characteristics of Wing Chun interactive art installations that are closely integrated with technological applications. In this context, relying solely on literature reviews and structured questionnaires would be insufficient to achieve the research objectives. Instead, qualitative research methods are necessary to inductively develop a theoretical framework. This study adopts the grounded theory approach and utilizes coding techniques to analyze and construct a spatial design framework for Wing Chun interactive art installations.

Grounded theory, introduced by Glaser and Strauss, is a qualitative research methodology that enables researchers to derive insights, uncover underlying logical relationships, and construct theoretical frameworks from empirical data (Glaser & Strauss, 1967; Heath & Cowley, 2004). By conducting an in-depth analysis of extensive and detailed experiential data, this method employs scientific logic, induction, deduction, comparison, and analysis to gradually elevate conceptual abstraction and systematically construct substantive theories from the bottom up.

To ensure the conceptual constructs and theoretical models derived from this study are firmly grounded in empirical data, thereby enhancing their reliability and validity, this research follows the triangulation principles established by Miles and Huberman. Primary data were collected through in-depth interviews with 15 participants, including five young users who have experience using Wing Chun interactive art installations (aged 15 to 24 to ensure sample representativeness), five Wing Chun coaches, and five operators of Wing Chun interactive art installations (see Table 1).

Table 1: Detailed data collection table

In-Depth Interviews	***Interview Description***
Interview Participants	A total of 15 participants, including five young users of the Wing Chun interactive art installation, five Wing Chun coaches, and five installation operators.
Interview Method	Face-to-face communication
Data Source	Interview transcripts

2.2 Open Coding

Open coding involves systematically coding interview transcripts line by line to extract key concepts. In this study, we performed sentence-by-sentence coding on the collected raw data. Through iterative summarization and discussion, we identified 74 preliminary concepts, which were coded as a1–a74. For example, the statement, "The design of the installation's environment makes me feel very comfortable, as if I am in a Wing Chun training hall," was abstracted into the concepts of "environmental comfort" (a1) and "cultural atmosphere" (a2). The results of the open coding process are summarized in Table 2.

Furthermore, by refining the core essence of these concepts, we categorized those with similar meanings into broader conceptual groups. Through categorical coding, we ultimately identified 14 key categories: environmental design, functionality, sensory experience, internal experience, meaning and symbolism, meditation and discipline, interaction and community, cultural heritage, identity and belonging, marketing and branding, economic benefits, market influence, overall experience, and feedback importance.

Tab.2 Categorization of open coding

Raw Statement	Extracted Concept	Categorical Code
"The environmental design of the installation makes me feel comfortable, as if I were in a Wing Chun training hall."	Environmental comfort (a1), Cultural atmosphere (a2)	Environmental Design
"The layout is reasonable, clearly distinguishing the training and interactive areas."	Layout rationality (a3), Functional convenience (a4)	Environmental Design
"The visual design is very appealing, blending traditional elements with modern technology."	Visual appeal (a5), Cultural style (a6)	Environmental Design
"The space design adapts well to practitioners of different levels, ensuring no discomfort."	Spatial adaptability (a7), Group suitability (a8)	Environmental Design
"The equipment is complete and meets different training needs."	Facility completeness (a9), Functional support (a10)	Functionality
"The lighting is soft, and the sound is moderate, without affecting training."	Lighting comfort (a11), Sound comfort (a12)	Sensory Experience
"The material texture of the installation enhances the traditional martial arts atmosphere."	Material texture (a13), Cultural experience (a14)	Sensory Experience
"The installation provides video tutorials and real-time feedback, helping me learn better."	Audiovisual assistance (a15), Learning support (a16)	Functionality

"When practicing here, I feel emotionally connected to Wing Chun culture."	Emotional connection (a17), Cultural resonance (a18)	Inner Experience
"The environment is quiet, making immersive learning possible."	Environmental quietness (a19), Inner experience (a20)	Inner Experience
"The installation helps me not only practice techniques but also understand Wing Chun philosophy."	Philosophical understanding (a21), Historical connection (a22)	Meaning & Symbolism
"The symbols on the walls and interactive design effectively convey Wing Chun's cultural significance."	Cultural meaning transmission (a23), Design inspiration (a24)	Meaning & Symbolism
"The use of symbols in the installation helps me better understand Wing Chun culture."	Symbol usage (a25), Cultural understanding (a26)	Meaning & Symbolism
"There is a dedicated meditation area where I can focus on my practice."	Meditation space (a27), Focus enhancement (a28)	Meditation & Practice
"The training methods immerse me, improving my concentration."	Personal growth (a29), Skill development (a30)	Meditation & Practice
"The installation helps me find inner peace during practice."	Inner peace (a31), Environmental support (a32)	Meditation & Practice
"I can practice with others, increasing interaction."	User interaction (a33), Community connection (a34)	Interaction & Community
"I enjoy the community atmosphere here, where people can exchange experiences."	Community belonging (a35), Interaction enhancement (a36)	Interaction & Community
"The design encourages cooperative learning and mutual progress."	Cooperative learning (a37), Skill exchange (a38)	Interaction & Community
"This is a great platform for learning about Wing Chun culture."	Cultural heritage (a39), Educational platform (a40)	Cultural Heritage
"The installation not only helps me train but also deepens my understanding of Wing Chun history."	Cultural event participation (a41), Identity recognition (a42)	Cultural Heritage
"I feel increasingly connected to Wing Chun culture and want to continue practicing."	Cultural heritage participation (a43), Identity recognition (a44)	Identity & Belonging
"The brand display is well done, allowing more people to learn about Wing Chun culture."	Brand display (a45), Value transmission (a46)	Marketing & Branding
"This place offers business cooperation opportunities, attracting more attention."	Business cooperation opportunities (a47), Brand appeal (a48)	Marketing & Branding

"Through the interactive installation, I learned more about Wing Chun-related products."	Product knowledge (a49), Service interest (a50)	Marketing & Branding
"If a reasonable pricing model is maintained, the installation should be financially sustainable."	Economic sustainability (a51), Cost rationality (a52)	Economic Benefits
"If the pricing is reasonable, I am willing to continue using it."	Payment willingness (a53), Value perception (a54)	Economic Benefits
"The service quality exceeded my expectations, making it highly cost-effective."	Service exceeding expectations (a55), Cost-effectiveness (a56)	Economic Benefits
"The marketing efforts are effective in increasing awareness of Wing Chun culture."	Marketing effectiveness (a57), Cultural interest (a58)	Market Influence
"The brand image is strong, attracting more people to learn Wing Chun."	Brand image (a59), Development confidence (a60)	Market Influence
"The marketing strategies make Wing Chun culture more appealing."	Marketing strategy (a61), Brand awareness (a62)	Market Influence
"The overall experience is great, and I would recommend it to friends."	Overall satisfaction (a63), Experience quality (a64)	Overall Experience
"The learning experience here is very valuable."	Learning value (a65), Practice experience (a66)	Overall Experience
"The service exceeded my expectations, and the cost-effectiveness is high."	Service exceeding expectations (a67), Cost-effectiveness (a68)	Overall Experience
"I feel that my feedback is valued, which makes me like this place more."	Feedback consideration (a69), Favorability enhancement (a70)	Feedback Consideration
"When my suggestions are adopted, I am more willing to use the installation again."	Suggestion adoption (a71), Reuse intention (a72)	Feedback Consideration
"I am willing to recommend this installation to my friends."	Feedback consideration (a73), Recommendation intention (a74)	Feedback Consideration

2.3 Axial Coding

Axial coding involves categorizing extracted concepts to form corresponding categories. As a crucial stage in grounded theory research, its primary task is to identify and establish logical relationships between categories. Through clustering analysis and logical relationships such as parallel and causal connections, potential associations between categories are explored. By systematically analyzing the relationships among various categories emerging from the open coding process, clues to

interconnections are identified, leading to clustering and the naming of core categories. This process helps reveal the organic connections within the data and lays the foundation for constructing a theoretical model.

Through analysis, the 14 categories have been further consolidated into six core categories: physical space, mental space, social space, commercial space, user satisfaction, and user loyalty. The logical relationships between these core categories, along with their corresponding subcategories and underlying concepts, are presented in Table 3.

Tab.3 Results of open axial coding

Core Category	Corresponding Category	Included Concepts
Physical Space	Environmental Design	a1-a8
	Functionality	a9-a10
	Sensory Experience	a11-a14
Mental Space	Inner Experience	a15-a20
	Meaning and Symbolism	a21-a26
	Meditation and Training	a27-a32
Social Space	Interaction and Community	a33-a38
	Cultural Heritage	a39-a42
	Identity and Belonging	a43-a44
Commercial Space	Marketing and Branding	a45-a50
	Economic Benefits	a51-a56
	Market Influence	a57-a62
User Satisfaction	Overall Experience	a63-a68
User Loyalty	Feedback Importance	a69-a74

During the axial coding process, we analyzed the logical relationships between the core categories to construct an organic theoretical model. The following is an analysis of the relationships among the core categories:

Physical Space and Mental Space: The environmental design and functionality of the physical space provide the foundation for the inner experiences and significance conveyance in the mental space. A well-designed physical environment can enhance users' emotional connections and cultural resonance.

Mental Space and Social Space: The inner experiences and cultural understanding within the mental space foster interaction and a sense of community belonging in the social space. When users connect with Wing Chun culture on a mental level, they are more willing to participate in community activities and cultural heritage transmission.

Social Space and Commercial Space: The interaction and community building in the social space provide a platform for marketing and brand promotion in the commercial space. Users' sense of identity and belonging to Wing Chun culture can enhance brand attractiveness and market influence.

Commercial Space and User Satisfaction: The economic benefits and marketing activities within the commercial space directly impact user satisfaction. Reasonable fees and services that exceed expectations can enhance the overall user experience.

User Satisfaction and User Loyalty: User satisfaction is the foundation of user loyalty. When users are satisfied with their overall experience with the installation, they are more inclined to provide feedback, reuse the installation, and recommend it to others.

Through axial coding, we have categorized the initial concepts into core categories and analyzed the logical relationships among these core categories, laying the groundwork for constructing a theoretical model.

2.4 Selective Coding

Selective coding involves extracting core categories from the main categories to construct a theoretical model. By analyzing the main categories and their subordinate categories formed during axial coding, we identify the core category and its relationships with other categories. The core category is user experience and cultural transmission. The core issues and its relationships with other categories are presented in Table 4.

Table 4: Core categories of selective coding formation and their relationships

Core issues	Associated Categories	Relationship Description
User Experience and Cultural Transmission of Wing Chun Interactive Art Installation	Material Space	The environmental design, functionality, and sensory experience of the material space directly influence user experience and provide a foundation for cultural transmission.
	Spiritual Space	The inner experiences, meaning communication, and training scenarios of the spiritual space enhance users' emotional connections and sense of identity with Wing Chun culture.
	Social Space	The interactions and community building within the social space, along with cultural transmission and a sense of belonging, promote communication among users and participation in cultural transmission.
	Commercial Space	Marketing and branding activities, economic benefits, and market influence in the commercial space affect the commercial value of the installation.
	User Satisfaction	User satisfaction is a significant indicator of user experience, reflecting the overall performance of the installation in various aspects.
	User Loyalty	User loyalty is the ultimate manifestation of user experience, reflecting users' long-term recognition and willingness to recommend the installation.

3. Construction of the Theoretical Model

3.1 Conceptual Framework of Wing Chun Interactive Art Installation Space Design

Based on the core issues of "User Experience and Cultural Transmission," the connotations of this core category have been organized, ultimately resulting in the theoretical model of the Wing Chun interactive art installation, as shown in Figure 1.

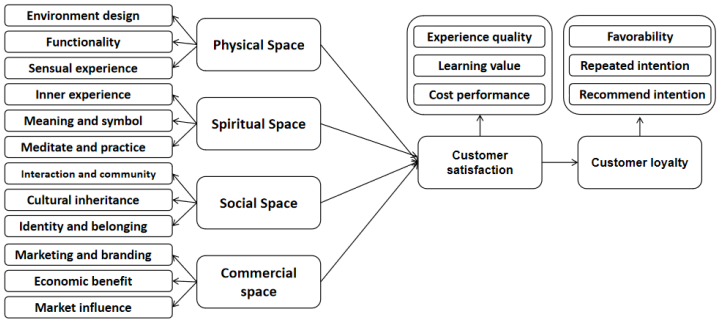

Fig.1 Conceptual frameworkof Wing Chun interactive art installation for user experience and cultural inheritance

Explanation of the Theoretical Model:

The user experience and cultural transmission of the Wing Chun interactive art installation encompass the design of material space, spiritual space, social space, and commercial space.

Material Space: By enhancing environmental design, functionality, and sensory experience, it provides users with a positive learning and practice experience, directly impacting user experience.

Spiritual Space: By improving inner experiences, meaning transmission, and training scenarios, it strengthens users' emotional connection and sense of identity with Wing Chun culture, enhancing user experience.

Social Space: By promoting interaction, cultural transmission, and a sense of belonging, it facilitates communication among users and increases participation in cultural transmission, thereby enhancing users' sense of belonging to Wing Chun culture.

Commercial Space: By enhancing branding, economic benefits, and market influence, it increases the commercial value of the installation and promotes the sustainable transmission of Wing Chun culture.

User Satisfaction: As an important indicator of user experience, it reflects the comprehensive performance of the installation in various aspects.

User Loyalty: As the ultimate manifestation of user experience, it reflects users' long-term recognition and willingness to recommend the installation.

3.2 SATURATION TEST OF THE THEORETICAL FRAMEWORK

In grounded theory research, testing for theoretical saturation is a key step in assessing whether the study has reached a state of theoretical completeness. Theoretical saturation refers to the point in the data collection and analysis process where new data no longer yield new concepts or patterns for the theory, indicating that the theory is sufficiently developed and comprehensive. This study conducted a theoretical saturation test on the interview records to ensure the integrity and reliability of the model.

After completing the axial coding, we randomly selected a subset of samples from the coded interview records and document materials for the theoretical saturation test. Specifically, several samples were randomly extracted from the already coded data, and coding analysis was continued to determine if any new categories or concepts emerged. The results of the test indicated that no new categories or relationships emerged for the core category and its associated categories. These results suggest that

the theoretical model in this study has achieved theoretical saturation, demonstrating high reliability and validity.

4. CONCLUSION

This study systematically analyzes the spatial design of the Wing Chun interactive art installation based on grounded theory and proposes optimization suggestions aimed at enhancing user experience and promoting the transmission of Wing Chun culture. Through in-depth interviews, the research identifies four dimensions—material space, spiritual space, social space, and commercial space—that impact user experience and cultural transmission. The findings indicate that optimizing these spatial designs can significantly enhance the educational value and cultural influence of the installation.

In terms of material space, the study suggests increasing the incorporation of Wing Chun cultural elements to enhance the cultural atmosphere of the environmental design. For spiritual space, it is recommended to strengthen users' emotional connections to Wing Chun culture by enhancing internal experiences and meaning conveyance. Regarding social space, promoting user interactions and community building can enhance users' sense of belonging to Wing Chun culture. In commercial space, optimizing marketing and branding activities can improve the installation's market impact and economic benefits.

The theoretical model and optimization suggestions provided by this study offer theoretical support and practical guidance for the design of the Wing Chun interactive art installation. Future research can further explore the performance of the installation in different application scenarios, providing additional theoretical and practical support for the sustainable transmission of Wing Chun culture. Through this study, we hope that the Wing Chun interactive art installation can better serve cultural transmission and education, injecting new vitality into the dissemination and development of Wing Chun culture.

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