

Article

Research on the Redesign of China's Intangible Cultural Heritage Based on Sustainable Livelihood—The Case of Luanzhou Shadow Play Empowering Its Rural Development

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Abstract: The majority of China's intangible cultural heritage is rooted in rural areas, and the integration of intangible cultural heritage (ICH) with rural resources has potential for sustainable development. This study develops a theory of sustainable livelihoods for ICH rural areas, employing design intervention strategies to strengthen core capital, thereby promoting the protection of ICH and the sustainable development of rural areas. Through a case study of China's ICH, specifically Luanzhou shadow play, this study focuses on core livelihoods capital: design capital and cultural capital. The key elements of the two were analyzed through the use of interviews and questionnaires. The Luanzhou shadow play was redesigned for cultural and creative products and digital application innovation. This approach effectively meets the needs of the target groups and meets the requirements of rural revitalization and ICH, thereby enhancing the adaptability and resilience of rural areas. This study offers a new development path for the heritage of Luanzhou shadow play and local rural areas while also providing a reference for the differentiated development of other non-legacy rural areas.

Keywords: intangible cultural heritage (ICH); sustainable livelihoods; rural development; design capital; cultural capital; Luanzhou shadow play



Citation: Sun, L.; Li, J.; Wang, Z.; Liu, W.; Zhang, S.; Wu, J. Research on the Redesign of China's Intangible Cultural Heritage Based on Sustainable Livelihood—The Case of Luanzhou Shadow Play Empowering Its Rural Development. *Sustainability* **2024**, *16*, 4555. <https://doi.org/10.3390/su16114555>

Academic Editor: John Carman

Received: 16 April 2024

Revised: 21 May 2024

Accepted: 24 May 2024

Published: 27 May 2024



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1. Introduction

Intangible cultural heritage (ICH) represents the cultural diversity of the world, carrying the civilization of human society, and it is crucial for civilized dialogue in the international community and the long-term progress of human society [1]. ICH with Chinese characteristics represents the distinctive spiritual values, modes of thought, and cultural sensibilities of the Chinese people [2]. It serves as a vital link, connecting the emotions of people worldwide. However, in the face of the challenges posed by globalization and modernization, ICH is facing unprecedented challenges and erosion.

Governments and society are increasingly emphasizing the protection and inheritance of ICH, actively seeking new ways to maintain its vitality [3]. From a global perspective, since UNESCO first proposed the concept of protecting ICH and promulgated the "Convention for the Safeguarding of the Intangible Cultural Heritage" in 2003, a consensus and action to protect ICH have been formed worldwide [4]. In China, since the country joined the Convention in 2004, various central government departments have issued a series of guiding documents. The "Law of the People's Republic of China on Intangible Cultural Heritage", enacted by the National People's Congress in 2011, represents the epitome of China's legislative framework for safeguarding intangible cultural heritage [3].

Against this backdrop, the academic community has also made numerous efforts. Scholars have engaged in innovative transformations and reuse of ICH through various forms, including the design of interactive animation experience projects [5], the integration

of traditional handicrafts with digital art [6,7], and the development of cultural and creative products [8]. These redesigns of ICH not only inject new vitality into ICH but also promote its widespread application and dissemination in modern society. For example, the redesign of artistic images from the “Yangliuqing New Year Prints” has resulted in the creation of products such as paper-cut lanterns [9], oil paper umbrellas [10], and keychains and desk calendars [11] generated using artificial intelligence technology. These products successfully combine ICH with modern design, satisfying consumers’ spiritual needs and showcasing its value and charm in modern life.

However, as the majority of Chinese ICH is rooted in rural areas [12], from a sustainable development perspective, if ICH cannot be effectively integrated with rural economic prosperity and significantly improve rural livelihoods and cultural industries, it will not effectively promote the widespread promotion of Chinese ICH. Consequently, integrating the theoretical framework of sustainable development into the development process of ICH can facilitate the wider dissemination and recognition of ICH while simultaneously promoting the transformation and upgrading of the rural economy. This approach can contribute to the achievement of coordinated and sustainable economic, social, and cultural development.

To achieve this goal, it is possible to draw upon the concept of the sustainable livelihoods framework (SLF), which is a comprehensive tool for the analysis and achievement of long-term community well-being [13]. This framework places emphasis on the enhancement of individuals’ and families’ capacity to access resources and the improvement of their resilience to economic and environmental shocks with the objective of achieving sustainable livelihoods [14]. In the context of rural ICH, the application of SLF injects diverse livelihood strategies into rural areas, enhancing their adaptability and resilience while providing solid support for the inheritance and protection of ICH traditions, promoting sustainable rural development, and assisting in the implementation of the rural revitalization strategy.

The primary objective of this paper is to achieve the sustainable development of ICH and rural areas through the redesign of ICH under the sustainable livelihoods framework. Under this overarching framework, the next section introduces the development background of rural areas and ICH as well as related theories. Section 3 analyzes the core livelihood capital of the specific case of Luanzhou shadow play and discusses the key elements of cultural capital under the guidance of design capital. Section 4 presents the redesign practice of Luanzhou shadow play, and Section 5 concludes the paper.

2. Research Theory

2.1. ICH in China

The 2003 UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage defines intangible cultural heritage as follows: “practices, representations, expressions, knowledge, skills—as well as the instruments, objects, artefacts and cultural spaces associated therewith” [15]. China, as a country with a long history and rich cultural traditions, is undoubtedly one of the most significant global repositories of intangible cultural heritage [16]. Currently, China’s five batches of national-level project catalogues include 1557 representative items of national-level intangible cultural heritage, which are categorized into ten major categories: folk literature, traditional music, traditional dance, traditional drama, quyi (Storytelling Traditions), traditional arts, traditional handicraft skills, traditional medicine, folk customs, and traditional sports, recreational activities, and acrobatics. Among them, “traditional handicraft skills” occupy a prominent position due to their profound cultural heritage and exquisite artistic value.

2.2. Rural Development and ICH

Chinese traditional cultural heritage is deeply embedded in traditional Chinese rural areas, and there is a historical homology between rural areas and ICH, with their development mutually reinforcing each other [17]. Rypkema [18] pointed out that historic preservation is a carrier for achieving broader purposes, with positive consequences in-

cluding job creation, job training, product differentiation, small business incubation, and tourism opportunities.

The development of rural areas in accordance with cultural heritage has become a significant industrial activity [16]. Song et al. [16] employed Lijiang City in Yunnan Province and Rizhao City in Shandong Province as case studies to demonstrate strategies for the utilization of local intangible cultural assets. Empirical research shows that rural areas can diversify the income of local residents and promote economic development through heritage tourism [19–22]. Such cultural activities facilitate the cultivation of talents that can become the backbone of the industry. More importantly, creative product design based on ICH not only supports the sustainable development of culture in contemporary contexts but also makes significant contributions to rural development. Li et al. [23] selected Shengzhou bamboo weaving, a traditional Chinese art, as a case study with the aim of identifying an efficient design intervention mechanism for rural social innovation and exploring a sustainable, collaborative design path to reduce rural poverty. Ye et al. [24] created a sustainable livelihood framework (SLF) using the Yao nationality as an example, enhancing the rural economy and eradicating poverty by transforming cultural heritage into productivity. Liufu et al. [25] documented 33 types of plants used for Hakka weaving, which are processed into various products. These products not only embody diverse traditional cultural connotations but also form a “non-heritage industry poverty alleviation” model. This model is a successful example of poverty alleviation and rural revitalization, as it was created through the joint participation of the government, enterprises, and farmers. It can be observed that the redesign of ICH is a powerful endogenous driving force for rural development, and the encouragement of rural development can also open up new possibilities for the effective inheritance of ICH.

Nevertheless, the current integration of rural development and intangible cultural heritage remains inadequate. These studies have primarily focused on the sustainability of either culture or rural economy, with little consideration given to the interrelationship between the two. From the perspective of research objects, there is a need to enhance the transplantability of significant cases and to optimize the path. Consequently, the integration of ICH and rural sustainable development through the lens of design intervention represents a significant and worthy area for further investigation.

2.3. Theoretical Framework of SLF

The concept of sustainable livelihood theory was first proposed in the report of the World Commission on Environment and Development in the late 1980s. The theory primarily emphasizes the maintenance or enhancement of resource productivity; ensuring access to and acquisition of assets, resources, and income; and storing sufficient food and cash to meet basic needs [26]. It is primarily applied to addressing poverty issues. Scoones [27] initially proposed a livelihood analysis framework, dividing it into natural capital, financial capital, human capital, and social capital. Currently, the most mature and widely applied framework is the sustainable livelihoods framework (SLF) proposed by the U.K. Department for International Development [28]. This framework categorizes capital into five parts: natural capital, human capital, financial capital, physical capital, and social capital, as shown in Figure 1. In essence, it serves as a diagnostic tool that assesses these capitals and implements intervention measures to enhance livelihoods and their sustainability either by increasing available capital or reducing vulnerability [13].

Ye et al. [29] explored the risks posed by vulnerable environments to farmers’ livelihoods. Wang et al. [30] constructed an evaluation system to quantitatively analyze farmers’ livelihood assets, and D’Annolfo et al. [31] analyzed the factors influencing these assets among farmers. Wu et al. [32] constructed a sustainable livelihood system dynamics (SD) model based on an expansion of the traditional sustainable livelihood framework. Although the SLF has demonstrated its effectiveness in multiple fields, a significant issue in the context of rural development with intangible cultural heritage is the neglect of cultural backgrounds [33]. It can be argued that culture is an asset that is of equal importance to a

region as other forms of capital. A substantial body of research has demonstrated that the utilization of traditional culture can facilitate the enhancement of the quality of life and livelihoods of community farmers [34]. Ma et al. [35] incorporated cultural factors into the SLF framework, exploring the role of culture in sustainable livelihoods among typical rural households in Wuyuan County, Jiangxi Province, China. Their findings indicated that traditional culture has become an indispensable livelihood asset in rural areas.

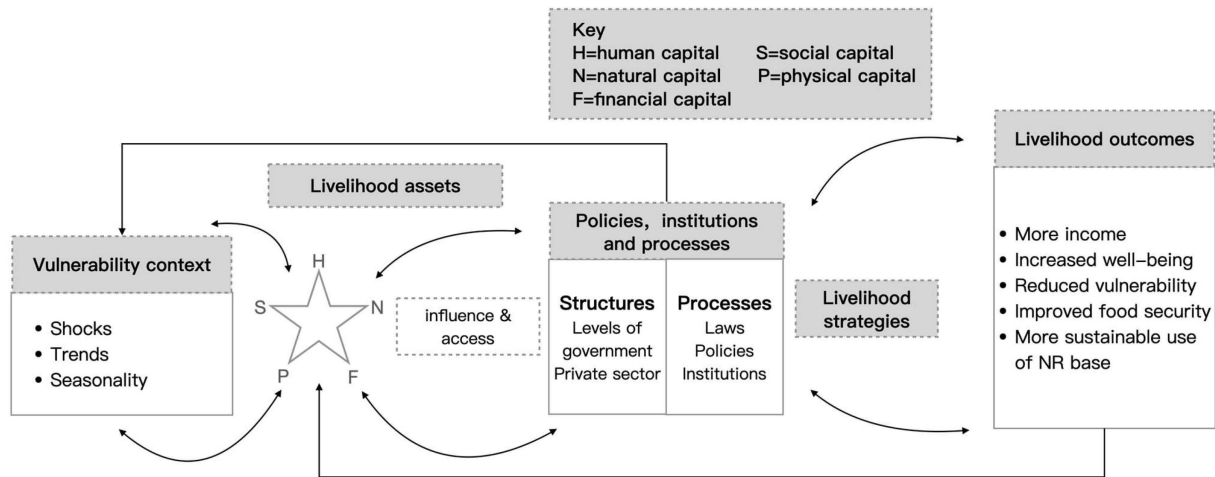


Figure 1. SLF by the U.K. Department for International Development.

2.4. The Construction of the SLF in Rural Areas with ICH under Design Intervention

The State Council’s Office of Poverty Alleviation has initiated a program that encourages universities, enterprises, and professional associations to assist these intangible cultural heritage workshops in enhancing their product design to align with current market demands [3]. In response to this initiative, as shown in Figure 2, this article employs design intervention strategies based on the SLF with the objective of enhancing cultural capital and achieving sustainable development in rural areas. The research focuses on rural areas with intangible cultural heritage, exploring comprehensive and sustainable livelihood strategies with the aim of improving the continuous participation of intangible cultural heritage in the rural economy, thus contributing to rural development.

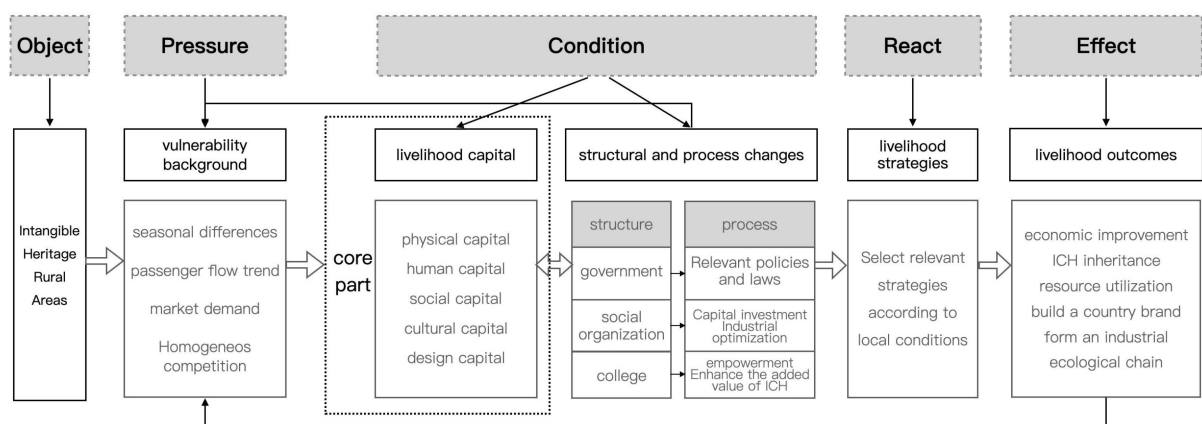


Figure 2. SLF in the intangible cultural heritage area.

The context of vulnerability [36] refers to external environments beyond human control, including specific conditions, trends, shocks, seasonality, etc. According to research, the vulnerability context is mainly manifested in four aspects: seasonal differences, tourist flow trends, market demand, and homogenized competition.

Livelihood capital [37] serves as the foundation for villagers' choices and livelihood strategies. From the perspective of design intervention, this study integrates and innovates the five major livelihood capitals: integrating financial capital into social capital, integrating natural capital into physical capital, and increasing cultural capital and design capital based on ICH resources. This study focuses on two dimensions of core livelihood means, namely internal cultural guidance (cultural capital) and external cultural dissemination (design capital), aiming to enhance the competitiveness of rural development.

Structural and institutional transformation [38] refers to the participation of governments and social organizations through laws, policies, and systems, which determines the ownership and mutual conversion of different types of capital. Wang et al. [12] studied different mixed governance models under different cultural, social, and economic heritage backgrounds. They highlighted the role of the government in effectively designing, validating, and promoting responsive solutions to address resilience in traditional Chinese villages. Universities' integration of ICH and the design and development of local cultural and creative products facilitate a synergistic effect between universities and local ICH protection [39], promoting innovative development of local intangible cultural heritage. This article, from the perspective of university faculty and students, primarily conducts research on ICH in rural contexts through design intervention strategies to ensure the inheritance of ICH and the sustainable development of rural areas.

3. Methodology

As illustrated in Figure 3, the method entails the construction of a targeted SLF, with Luanzhou shadow play serving as a case study. This is followed by an investigation and analysis of the core livelihood capital and its influencing factors through interviews and questionnaires. In the empirical analysis and discussion, the key elements of cultural capital are extracted and discussed in practice, with the guidance of design capital. On this basis, a sustainable development path for promoting rural revitalization by redesign of ICH is constructed, and limitations and future research are proposed.

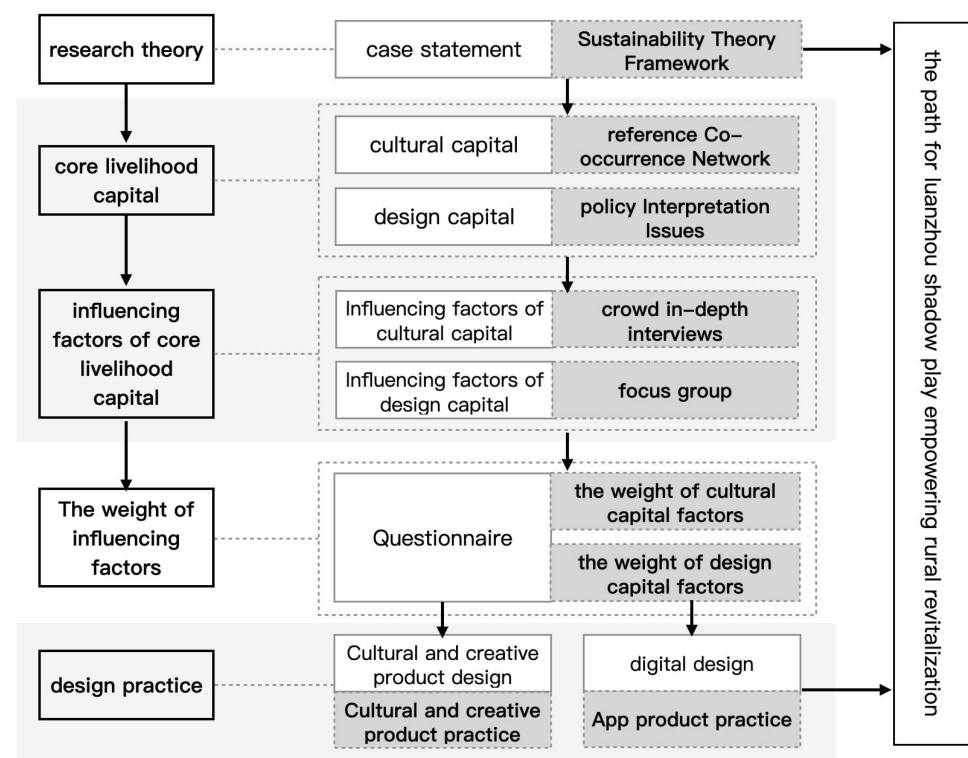


Figure 3. Research process.

3.1. Participants

The study, which involved questionnaire surveys and interviews, was conducted in accordance with ethical guidelines and principles to ensure the rights and well-being of the participants. It was also subject to a thorough review and approval by the scientific research management department of the college. Participants in the questionnaire surveys and interviews were provided with detailed information regarding the purpose, procedures, and potential implications of their involvement. Participation in both the questionnaire surveys and personal interviews was entirely voluntary. It was made clear to participants that they were at liberty to decline participation or withdraw from the study at any stage without facing any consequences. Strict measures were taken to protect the privacy of questionnaire survey participants.

This study involved a total of four interviews and research questionnaires, all conducted from 26–28 May 2022. The first interview used stratified sampling [40] to survey respondents from eight different provinces and occupations. The interview data are detailed in Table 1. The second method was a focus group interview [41] conducted with 20 relevant experts in classroom C205 of the School of Arts and Design at Yanshan University on 28 May 2022. Under the guidance of a moderator, in-depth discussions were held on the influencing factors of design capital in rural areas with intangible cultural heritage. The meeting was audio-recorded, and the data were coded using NVIVO 20.0 to identify the core categories of influencing factors. The third questionnaire aimed to investigate people's main memories and expected characteristics of Luanzhou shadow puppets. It was released online on 6 June 2022, and by the 10th, a total of 105 valid questionnaires were collected. The fourth questionnaire was a satisfaction survey for design practices. It was released on 12 June 2022, and by 15 June, a total of 248 valid questionnaires were collected.

Table 1. Cases of in-depth interviews with people related to ICH.

User Type	Basic Information	Physical Culture Level	Behavioral Culture Level	Spiritual Culture Level
A-1	Zhang, 22, master's, an ordinary consumer	He pays attention to the shape of the design products and will have the desire to buy items whose shape and color meet his aesthetic ideals. He finds unique, special designs are more attractive.	He will consume items with strong utility. He is eager to interact with intangible cultural heritage products. He prefers the offline format because it can be shared by taking pictures	He will buy intangible cultural heritage products related to himself such as his hometown or idol. He has a cultural identity with Chinese culture. He is satisfied in making ICH products. He desires to make products that are both aesthetic and utilitarian. He returns to relevant areas to conduct field research and inherit regional culture. Opening a blind box that she likes is very fulfilling and completely satisfying for inner pleasure. Shadow puppet assembly type designs will help to understand the structure and strengthen the cognition of ICH.
B-2	Mr. Sun, 49, works in Shenzhen, intangible cultural heritage craftsman	The intangible cultural heritage design in which he specializes will be collected. He will make his own evaluation on the ICH designs on the market.	He will remake and reuse some designs. Designs with strong practicality are more inclined to focus on the workmanship of the design and the reputation of the designer.	It is the designer's mission to design good products, and it is also the best way to promote national culture. There is a sense of cultural pride and satisfaction in the design process.
C-1	Meng, 24, a master's student in Tianjin, a lover of ICH design	She likes to visit ICH art exhibitions and is willing to pay for ICH design She has favorite types of ICH, such as Luanzhou shadow play.	She likes blind box because of its interactivity. The form of consumption is as important as the content.	
D-1	He, 23, a graduate student in Chengdu, a cultural and creative designer	In the postgraduate course, he has learned about ICH and designed products. He pays more attention to shape and color.	He will add a sense of interaction to the design so that consumers feel very interested and have the desire to consume, and he will strive to add a sense of plot and story to designs.	

3.2. Background of the Case

Luanzhou shadow play [42] is an ancient traditional folk art form, which originated in the Wanli period of the Ming dynasty. It is one of the principal representatives of the northern shadow play among the three major schools of Chinese shadow play (Shanxi shadow play, Chaozhou shadow play, and northern shadow play), which was included in the first batch of the National Intangible Cultural Heritage List, as shown in Figure 4.



Figure 4. Luanzhou shadow play.

The term “shadow play” is derived from the material used to create the puppets, which are crafted from donkey skin. This particular type of play is also referred to as “donkey shadow play” [43]. The repertoire of shadow play is typically extensive, and its singing style has evolved in conjunction with the characteristics of Gaoqiang, Peking opera, and the folk art of the Luanzhou area, which has exerted a certain influence on the formation and development of Pingju opera [44]. During the performance, there is a large, plain paper screen in front of the shadow puppet and lights behind it. The performers stand behind the screen, holding the figure up to dance, accompanied by lyrics and music. With the development of technology, this heritage urgently needs new technology to have new life. For instance, the graphic structure of Wayang Purwa can be employed as a reference form for illustration works to develop and continue Wayang opera in Indonesia [45]. There are also studies aimed at developing animation media as a medium to preserve traditional culture [46]. Furthermore, three-dimensional display of shadows may be more helpful in preserving shadow puppet art [47]. In China, Chen et al. [48] extracted the features of shadow puppet patterns based on eye movement experiments and conducted sensory evaluations of colors and then analyzed the results for pattern extraction and design evolution, which were finally applied to the design of cultural and creative products in the lighting category. Huang [49] constructed a database of traditional shadow puppet characters, combining the real human form and appearance with traditional shadow puppet features to create personalized shadow puppet character designs. Chen proposed an interactive method similar to traditional shadow play to control digital shadow puppets, utilizing Kinect devices and shadow puppet props with color markings. In Malaysia, Khor [50] identified four principal aspects of the visual style of Wayang Kulit Kelantan: puppets, shadows, shadow projection screens (Ke-lir), and their light sources. The study also reviewed methods and techniques used to capture the visual style of Wayang Kulit in animation, films, artworks, comics, and video documents.

3.3. The Core Elements of Livelihood Capital in Luanzhou Shadow Play Rural Areas

Luanzhou prioritizes high-quality development and steadily advances the implementation of its rural revitalization strategy. DonganGezhuang Town, located in Luanzhou City, is renowned as the birthplace of shadow play and is considered one of the four most famous towns in the area. The local government attaches great importance to the excavation of cultural heritage and the promotion of local customs and civilization to help rural revitalization [51]. In the context of Luanzhou shadow play and rural sustainable livelihood capital, it is essential to recognize the pivotal role of universities, enterprises, villages, and intangible cultural heritage artists and build a positive and sustainable development operation mechanism, as shown in Figure 5. This should focus on the design capital and cultural capital, with brief discussion on the participation path of human capital. Furthermore, it is crucial to actively promote “innovative ICH” in order to provide feedback to local governments, create differentiated development, and help rural revitalization.

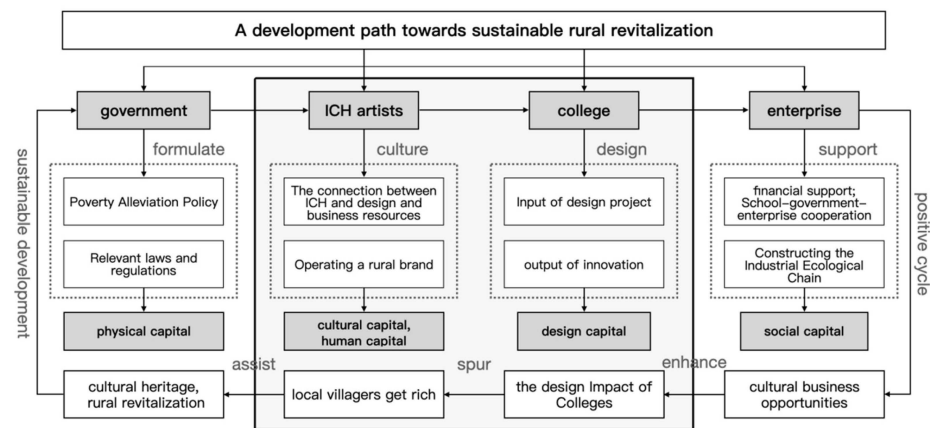


Figure 5. Positive sustainable development mechanism.

Scientific planning based on government guidance: Government departments assume the role of organization, coordination, guidance, and support by formulating policies and creating an environment conducive to the mobilization of enthusiasm among villagers and the market. Furthermore, they aid in the mutual promotion of the government and the market. Intangible cultural heritage artists as the main body, with multi-party participation: By strengthening the cultivation and support of these artists, the fundamental interests of farmers can be safeguarded, and an effective business model mechanism can be established. Innovative design with the strength of colleges and universities: It is necessary to enhance the inheritance, protection, and utilization of Luanzhou shadow play culture. In order to achieve this, it is essential to fully utilize the enabling role of design capital, to tap rural humanistic value, and to cultivate a new driving force for rural development. Market operation is the key and characteristic development: It is essential to align with the actual path of rural areas, enhance design quality, prevent misguided investment and homogeneous construction, foster a harmonious relationship between upstream and downstream, and cultivate a beneficial ecological industrial chain. In this process, the human capital of sustainable livelihood in rural areas is of particular importance, and the key lies in the villagers.

This paper examines the research and development of ICH redesign projects within the context of industry–education integration and school–enterprise collaboration, with the objective of facilitating rural development. The research is conducted in three forms: cultural and creative product design, performing arts design, and digital design. This encompasses a range of activities, including visual promotion, the creation of artistic and cultural products, and other methods of refining, publicizing, and operating rural brands. A variety of new media and offline art galleries and museums, along with other activities, will be employed to disseminate shadow play performance art in multiple directions. The digital design of shadow play will be realized through the mode of literary entrepreneurship.

3.4. The Construction of Cultural Capital Framework

The analysis of the literature on shadow play culture revealed that the main research hotspots can be divided into three categories: appearance, behavior, and spirit. As shown in Figure 6, this division is based on the literature co-occurrence network.

In accordance with the pertinent policies [52], this paper concentrates on three aspects of design capital: cultural and creative product design empowerment, performing arts design empowerment, and digital design empowerment. The core elements of cultural capital and design capital are shown in Figure 7. The formation of cultural capital through design intervention can act as an endogenous driving force for rural development, thereby promoting endogenous development. The objective is to emphasize the joint effect of internal and external resources and to convert external intervention (design capital) into a driving force for internal development and construction [53].

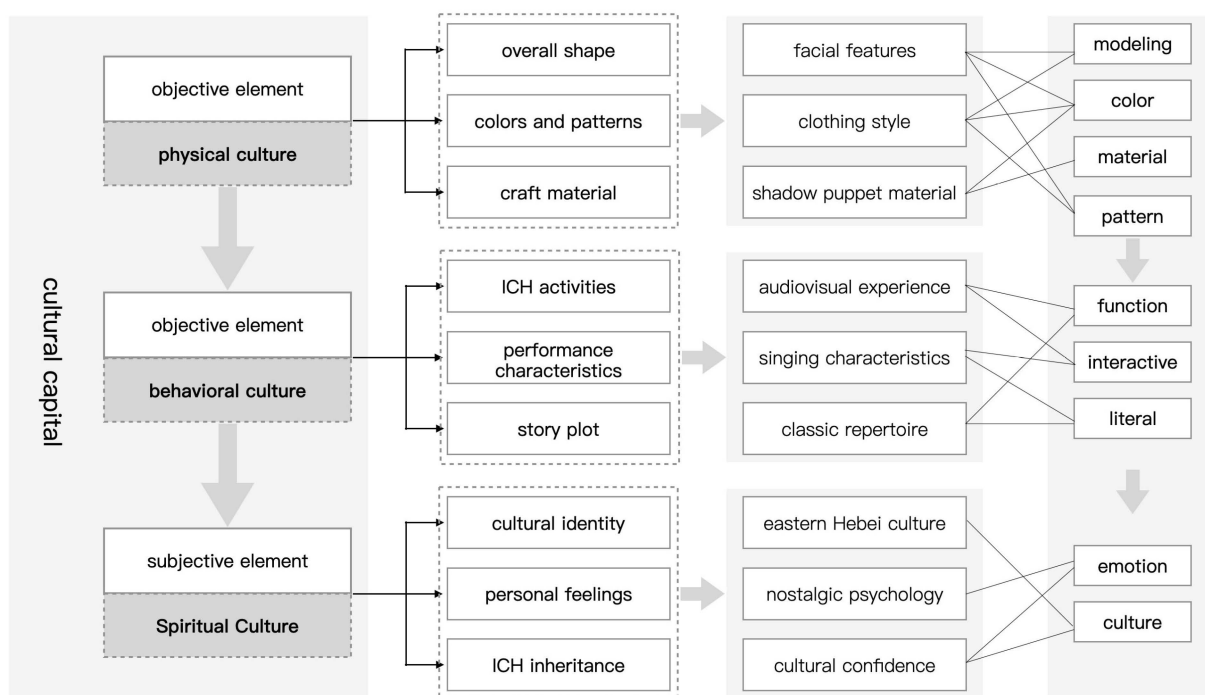


Figure 8. Analysis of cultural capital elements.

1. Physical culture is mainly the appearance level of intangible cultural heritage. It has obvious regional characteristics, and most of them are manifested in their shape, color, material, decoration, and other dominant forms in traditional skills and traditional art;
2. Behavioral culture is reflected in folk activities and usually is unique to the region where the immaterial culture is located, including interaction, language, and functional experience. It is a kind of dynamic form achieved through the interaction between people, people and objects, people and scenes. Behavioral experience awakens the resonance of experiencers, satisfies their immersion in time and space, and enables them to obtain a deep understanding of ICH. For example, the unique singing method by pinching the throat, which is used in Luanzhou shadow play, matches the singing rhythm of the characters' inner thoughts [54]. Behavioral culture can be divided into local activities, performance characteristics, and storylines;
3. The ICH is based on the cultural identity of the rural people, and the spiritual cultural aspects should take into account the cultural identity of the region and even the nation as well as the return of the personal emotions of experiencers. Therefore, it is divided into personal feelings, cultural identity and cultural heritage.

3.5. The Construction of Design Capital Hierarchy Framework

In order to understand the design capital of ICH in rural areas within the framework of sustainable livelihoods, the author invited 20 relevant experts to conduct a focus group and finally summarized and collected nine factors that may affect the design capital for in-depth discussion. As shown in Figure 9, the nine factors are grouped into three areas: cultural and creative product design empowerment, performing arts design empowerment, and digital design empowerment. Among them, there are three influencing factors for the empowerment of cultural and creative product design: the aesthetics of non-heritage cultural and creative products, the local characteristics of cultural symbols, and the visibility of rural cultural features, among which the local characteristics of cultural symbols are relatively important. The variety of shadow play performance techniques, the integration of the performance system process, and the features of local folklore projects—of which the latter are more appealing to users—are the variables that influence the empowerment of performing art design. The innovation of the digital service system, the fluency and

comfort of the experience process, and the diffusion of rural ICH are the variables impacting digital design. The fluency and comfort of the experience process can significantly increase user happiness.

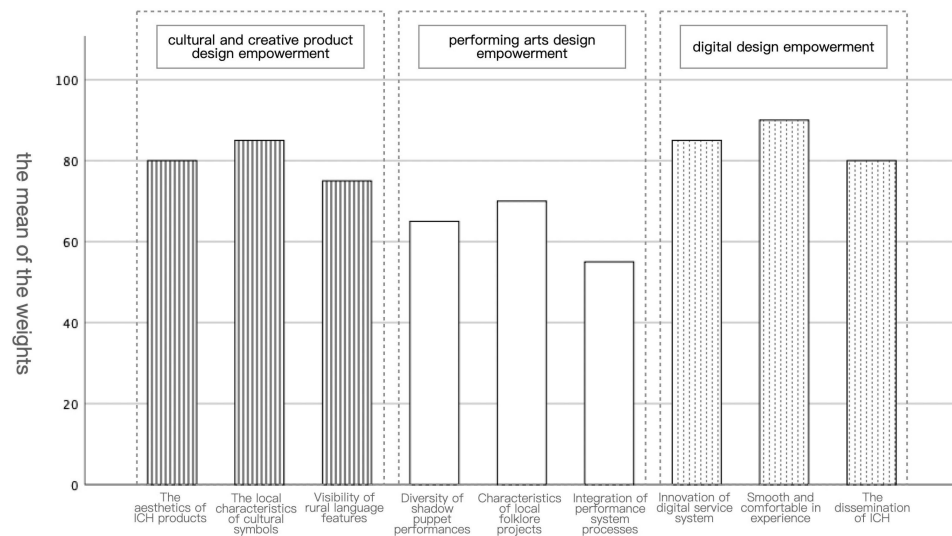


Figure 9. Analysis of design capital elements.

4. Empirical Analysis—Luanzhou Shadow Play Culture Redesign Practice

4.1. Extraction of Shadow Play Culture Capital Elements

Figure 10 illustrates the extraction of elements of cultural capital. Based on this, secondary indicators were constructed, and questionnaires were created to investigate the main memory points and expected characteristics of Luanzhou shadow play. A total of 105 questionnaires about the physical culture, behavioral culture, and spiritual culture of Luanzhou shadow play were gathered, and 105 were recovered. By ranking the weight of each index, the typical elements with higher weight ranking of each level were selected for design transformation. The following section presents the selection and transformation of cultural and design capital, as illustrated in Figure 11.

physical culture		
facial features	clothing style	shadow puppet material
sky-high nose, slanted eyes, cherry mouth, pointed chin, five-point face, seven-point dress	male role, female role, painted face role, the old role, clown role, beard role, the great role, Fairies and monsters	Carved from cow and donkey skin, dull color
behavioral culture		
audiovisual experience	singing characteristics	classic repertoire
paste, hit, take, pull, sing	south: Fast horse and knife, fast pace north: Man's voice is touching, the tune is gentle	《The legend of deification》 《Tower of Injustice Suppression》
Spiritual Culture		
eastern Hebei culture	nostalgic psychology	cultural confidence
the hometown of shadow play	Combine childhood stories to create a nostalgic atmosphere and evoke childhood memories	The collision of shadow play and modern elements

Figure 10. Extraction of cultural capital elements.

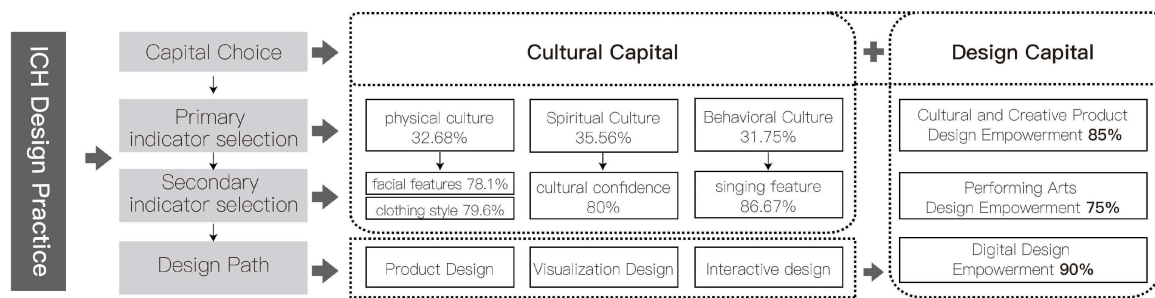


Figure 11. The transformation of cultural capital and design capital.

4.2. Design Practice

The design focuses on the secondary indicators with high user expectations, e.g., facial features, clothing features, singing features, and cultural confidence, combined with design capital to realize the cultural and creative product design as well as digital design.

Firstly, two capital elements of object culture were analyzed: facial features and clothing styles. The patterns of costumes and headdresses in Luanzhou shadow play classic models were extracted. Following the normalization and translation of patterns [55], traditional patterns such as four-leaf patterns, double-happiness patterns, mass of decorative pattern, moiré patterns, and water patterns were formed. Two continuous shading patterns were generated for further design in Figure 12. Then, through color extraction of different types [56] of Luanzhou shadow play, such as classic figures and appliance field films, we summarized three colors with the highest frequency of application: red (C: 37%, M: 97%, Y: 83%, and K: 3%), yellow (C: 1%, M: 29%, Y: 81%, and K: 0%), and green (C: 85%, M: 48%, Y: 84%, and K: 3%), as shown in Figure 13.

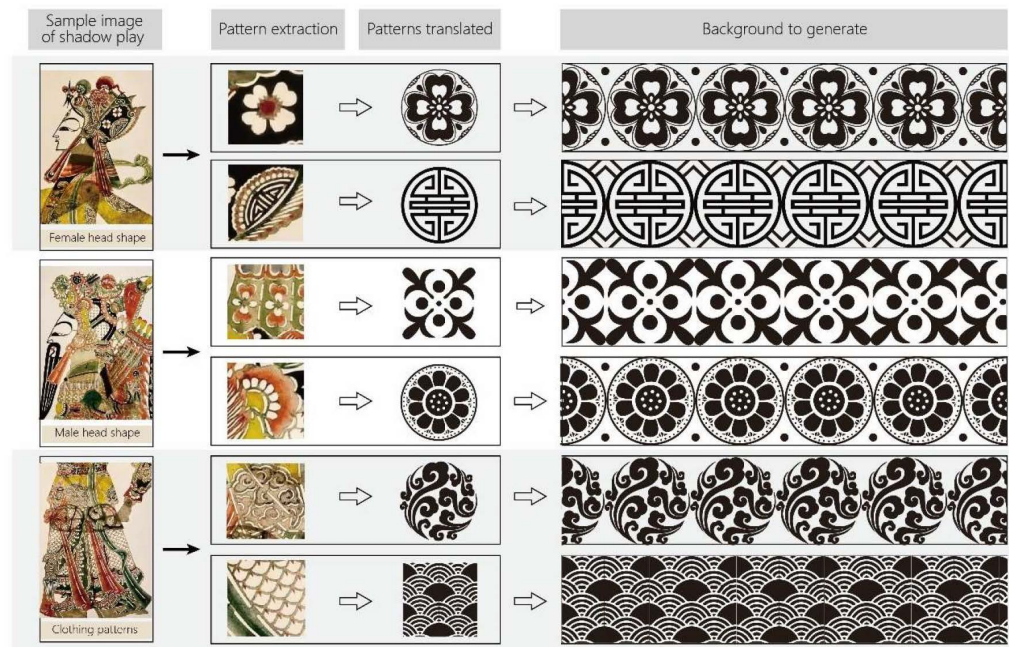


Figure 12. Shadow sample image pattern extraction.

Finally, the head shapes of Luanzhou shadow play characters are presented as examples [57], including the basic images of male, female, painted face, old, clown, beard, great, and fairy and monster roles, as illustrated in Figure 14. These were applied in the design of cultural and creative products to highlight the facial features of shadow play and to popularize science about the head shape of all kinds of shadow play so as to reduce the cognitive burden of users. The above three characteristics of Luanzhou shadow play

were integrated and redesigned, and cultural and creative products were designed to help protect and inherit rural culture so as to design products about people’s livelihood or stationery, such as calendars and bookmarks, which are widely spread and conducive to rural revitalization. This enables shadow puppetry knowledge to permeate daily life.



Figure 13. Shadow sample color extraction.



Figure 14. Examples of the categories of Luanzhou shadow play head shape.

Flicking through a calendar or using a bookmark (Figure 15) to jog a user’s memory will efficiently satisfy the three levels of “physical culture”, “behavioral culture”, and “spiritual culture” selected by the survey group with greater weight in cultural capital. In this way, Luanzhou shadow play can be inherited and developed.



Figure 15. The cultural and creative product design case of Luanzhou shadow play.

In order to facilitate digital design, we integrated Luanzhou shadow play cultural capital, design capital, and human capital. This was achieved by combining the patterns, colors, and classic stubbly categories extracted above with the Luanzhou shadow play publicity and experience platform. The experience platform, which is primarily presented by a mobile application, was designed as the “Luanzhou Shadow Bar” (Figure 16). Its

design is based on three key influencing factors: the innovation of the digital service system, the fluency and comfort of the experience process, and the diffusion of rural ICH.

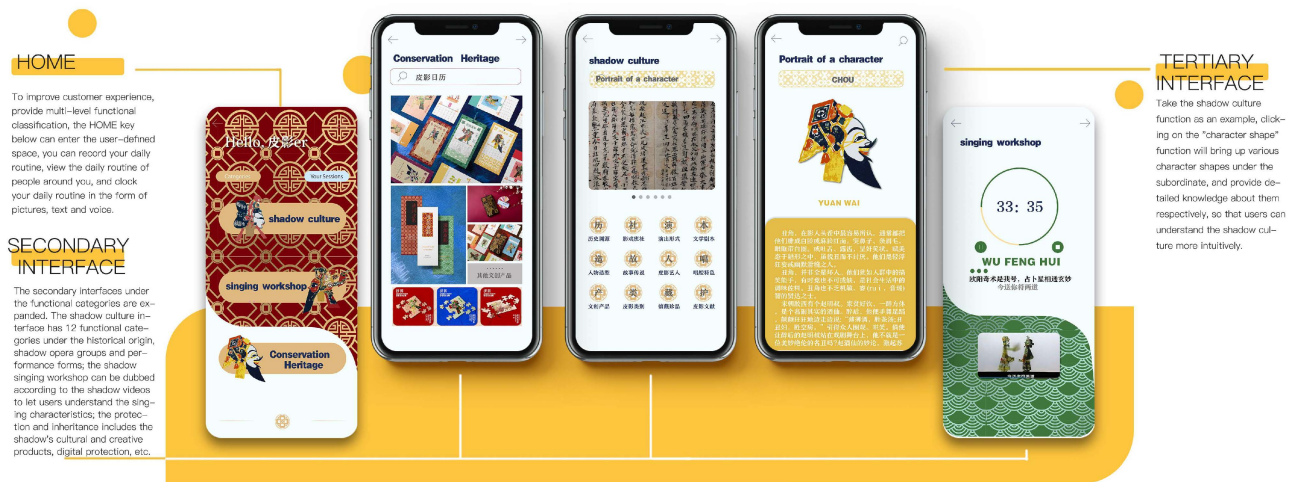


Figure 16. Luanzhou shadow play propaganda experience platform.

The platform offers a multifaceted approach to fostering livelihood transformation and capacity training for villagers. It provides users with an immersive shadow play experience, access to knowledge about shadow play, the opportunity to purchase and customize cultural and creative products and other services, and a gateway to developing the Luanzhou intangible cultural heritage brand. By doing so, it contributes to the protection and inheritance of rural culture through ICH design. In order to enhance the user experience, the application employs a multi-level functional classification system. The HOME button allows users to enter their own personal space, record their shadow play experiences, monitor the shadow performance of others in their vicinity, and input information in the form of images, text, and audio. The three main sections are as follows: “Shadow Play Culture”, “Shadow Play Singing Workshop”, and “Protection and Inheritance.” The secondary interfaces of the three sections were expanded, and 12 functions of the “Shadow Play Culture” interface were classified, including its historical origin, shadow play clubs, and performance forms. The “Shadow Play Singing Workshop” can be designated according to shadow play videos, thus enabling users to comprehend the singing characteristics. The “Protection and Inheritance” section encompasses shadow play seminars in colleges and universities, the customization and purchase of shadow play cultural and creative products, the booking of local shadow play homestays, and offline shadow play production workshops. This provides a discussion platform for university design projects and Luanzhou shadow play joint projects and to involve local villagers in the production of handicrafts, arts, and cultural products so as to give full play to the role of human capital in the sustainable livelihoods framework. The three-level interface takes “Shadow Play Culture” function as an example. Users can click or search the function of “Character Modeling” to understand various figures of subordinates and detailed knowledge popularization on them so that users can learn Luanzhou shadow play culture more intuitively.

5. Discussion

5.1. Design Experience Assessment

To further evaluate the benefits generated by the participation of cultural and design capital under the sustainable livelihood framework, a systematic satisfaction assessment was conducted using the method of emotional experience vocabulary. The evaluation was conducted in three stages, as illustrated in Figure 17. In the first step, interviews and the online comment collection were analyzed from the perspective of emotional experience

and inheritance to collect users' authentic feedback. The NVivo 20.0 qualitative analysis tool was used to analyze the comments and extract 18 key vocabulary words. In the second step, the extracted vocabulary underwent preliminary coding using NVivo 20.0 for refining, merging, and categorizing to obtain design capital dimension categories, including (1) empowerment of cultural and creative product design, which includes key words such as "beautiful patterns", "novel appearance", and "national style"; (2) empowerment of performance art design, which includes "excellent craftsmanship", "attractive singing style", and "detailed knowledge"; and (3) empowerment of digital design, which includes "fashion innovation", "cultural pride", and "desire for experience." In the third step, based on the key words, a "Luanzhou Shadow Puppet Intangible Cultural Heritage Design User Satisfaction Data Sheet" was compiled, and satisfaction was rated on a scale of 1–5. The satisfaction and evaluation methods are presented in detail in Figure 9. In the survey and evaluation process of the third step, a total of 248 valid questionnaires were collected, with values ranging from 1 to 5, representing reports from dissatisfied to very satisfied. The survey shows that "desire for experience", "cultural pride", and "attractive singing style" are ranked highest in satisfaction, while "novel appearance", "detailed knowledge", and "excellent craftsmanship" have slightly lower satisfaction scores. However, with scores all above 4, it is evident that the target group is generally satisfied with the redesign of Luanzhou shadow puppet culture, which also meets the needs of rural revitalization and the sustainable development of intangible cultural heritage by meeting the demands of the target group.

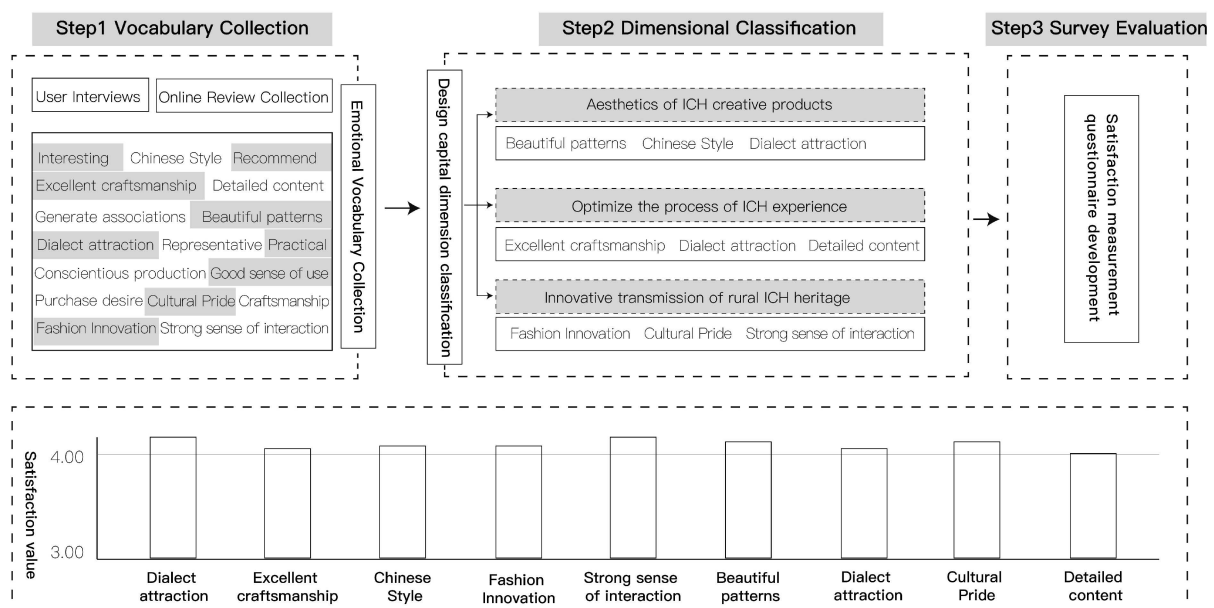


Figure 17. Assessment of satisfaction with emotional experience.

This study aimed to construct a sustainable livelihood framework from the perspective of redesigning intangible cultural heritage. Experimental results show that design practices based on the design capital and cultural capital of this framework received good evaluations in experiential assessments, validating the feasibility and effectiveness of this framework.

5.2. Practical Implications

Based on the design capital practices and evaluation results mentioned above, three design intervention strategies were identified:

- (1) **Cultural and Creative Product Design Path:** By enhancing the aesthetics of cultural and creative artworks, the novelty of appearance, national style, and other artistic

- styles, shadow puppet culture can be integrated with landscapes, daily necessities, etc., to refine, promote, and operate rural brands;
- (2) Performance Art Design Path: Starting from the exquisite craftsmanship of artistic works during shadow puppet performances, the attraction of shadow puppet singing, and the detailed knowledge of performance content, through various new media forms such as Tiktok, WeChat, and Weibo as well as traditional media programs such as “National Treasure” and “Heirs” and offline activities in art galleries and museums, multidirectional dissemination of shadow puppet performance art can be conducted, enhancing the audience’s initiative and interaction and injecting new vitality into solidified artistic forms;
 - (3) Digital Design Path: Based on successful cases of Dunhuang cultural and Palace Museum cultural creation, digital innovation of shadow play can be achieved in cultural and creative industries such as games, music, etc., such as Luanzhou Shadow Puppet Bar, customized shadow puppet game skins, and immersive shadow puppet operation experiences based on virtual reality technology.

From the perspective of establishing a sound protection and inheritance system for Luanzhou shadow play through a modern design context and rural revitalization strategies, the brand value and commercial value of Luanzhou shadow play can be fully explored. This enables rural households to possess innovative thinking in intangible cultural heritage, transforms cultural inheritance channels, allows local villages to create intangible cultural heritage IP with a more independent and confident attitude and actively inherit and develop the cultural heritage of rural areas, revitalizing rural areas.

6. Conclusions

This study proposes an innovative path for promoting the sustainable development of intangible cultural heritage (ICH) in rural areas through the redesign of ICH, which has demonstrated positive effects. The research initially analyzed the factors influencing core livelihood capital through interviews and questionnaires, focusing on the material culture, behavioral culture, and spiritual culture components of cultural capital. Based on these findings, a series of design practices were conducted in three forms: cultural and creative product design empowerment, performance art design empowerment, and digital design empowerment. These were derived from design capital. Ultimately, the emotional experience satisfaction of the redesigned ICH under the design interventions was evaluated.

However, this study also has some limitations. Firstly, while data were collected through questionnaires and user feedback, the sample size may have limited the generalizability of the results. Secondly, the study primarily focused on design interventions but lacked an in-depth exploration of how to continuously maintain and update the design intervention strategies to adapt to the changing rural socio-economic environment. Future research could expand the case study scope, increase sample diversity, and further investigate the long-term sustainability of design intervention strategies.

Author Contributions: Conceptualization, L.S.; methodology, J.L. and Z.W.; software, S.Z.; validation, J.L.; formal analysis, J.L.; investigation, Z.W.; resources, L.S. and W.L.; data curation, S.Z.; writing—original draft preparation, J.L. and Z.W.; writing—review and editing, S.Z. and J.L.; visualization, Z.W.; supervision, L.S. and W.L.; project administration, J.W.; funding acquisition, L.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the National Social Science Fund of China, grant number 22BG125.

Institutional Review Board Statement: This research was approved by the authors’ college of the university.

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

Data Availability Statement: The data used to support the findings of this study are available from the corresponding author upon request.

Acknowledgments: We would like to thank the anonymous reviewers for their time and effort devoted to improving the quality of this research.

Conflicts of Interest: The authors declare no conflicts of interest.

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