Proceedings of the Design Society, Volume 5: ICED25
https://doi.org/10.1017/pds.2025.10265

Museum mobile APP design based on user experience

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ABSTRACT: This paper presents the Chinese Cizhou Kiln culture via a User Experience (UX) based mobile APP. By applying Garrett's UX methodology, this research proposes a 'Culture-UX Integration Framework'. Section 1 introduces the digital background for heritage designs. Section 2 describes the Cizhou Kiln development challenges. Section 3 provides the examples of the existed crafts APP designs. Section 4 illustrates the Hi-Fi prototype. Section 6 contains the evaluation and validation parts of this work, and this paper ends by Section 7, the conclusion. This paper contributes a novel of the knowledge that design paradigm balancing heritage preservation and functionality, validated via testing. The authors' framework offers replicable methods for digital heritage design, By merging aesthetics, function, and culture, it advances preservation.

KEYWORDS: Cizhou Kiln, user experience design, creativity, design methods, innovation

1. Introduction

Traditional handicraft is an important part for the human culture. With the development of mobile networks, information technology and portable mobile terminals, new media platforms such as smartphone applications (APPs) have become new carriers of cultural communications. In China, the design and production system of Cizhou Kiln illustrates a significant classification of the traditional handcrafts culture of the Chinese people. This paper has seven sections. Section 1 provides an overview of integrating Cizhou Kiln culture into app design for preservation and promotion. Section 2 describes the cultural context and challenges in heritage preservation. Section 3 illustrates Garrett's UX framework (strategy to surface layers). Section 4 analyzes existing craft apps for cultural-engagement insights. Section 5 proposes the 'Culture-UX Integration Framework'. Section 6 evaluates usability via task-based testing and optimizations. Section 7 concludes outcomes, impacts, and future research directions. Taking user experience as the core, a 'culture-user' two-way driven design paradigm is constructed to realize the innovative design and application of Cizhou Kiln Culture APP from the aspects of visual information architecture, product function module, interaction design, UI interface design, etc. At the same time, The public's psychology is analyzed in depth, improve the user experience of the new media platform, and help Cizhou Kiln Culture Communication.

1.1. Research background

Intangible cultural heritage is formed by the long-term accumulation of the history, culture and traditional customs of a country or nation. With globalization, the intangible cultural heritage of all nations faces the threat of mainstream culture to varying degrees. Many traditional folk skills are disappearing from people's sight, making its safeguarding a crucial task for governments and people worldwide (Lin & Lian, 2018). Intangible heritage culture is the 'living' carrier, 'living' memory and 'living' specimen of a nation, and it depends on people. Because of this, its transmission is more fragile, uncertain and selective than that of tangible cultural heritage, and the intergenerational links of transmission are more easily interrupted (Song et al., 2019). The 2003 UNESCO Convention for

the Safeguarding of the Intangible Cultural Heritage divides the intangible cultural heritage into five categories: oral traditions and expressions, performing arts, social practices and festivals, practices of knowledge of nature and the universe, and traditional crafts (Kurin, 2007). Among them, traditional handicrafts, as a symbol of regional characteristics, not only reflect the unique culture of a particular region, but also serve as a bridge between the past and the future (Liu et al., 2024). Under the rapid development of modern technology and the influence of globalization, traditional handicrafts are facing increasingly serious threats. Chinese culture has a long and profound history (Zhang et al., 2019). Cizhou Kiln firing technology since the beginning of the Northern Dynasties, the Northern Song Dynasty reached its peak, through the Ming and Qing dynasties continue to this day. Cizhou Kiln firing technology was also included in the first batch of China's intangible heritage cultural list in 2006, but now in the context of the Internet Cizhou Kiln industry development is not good. Traditional handicrafts are cultural expressions, characterized by aesthetics, practicality, regionality, delicacy, etc., and contain rich values (Zhang et al., 2019), Cizhou Kiln firing technology as a traditional handicraft, relying on the Internet for innovation should not be delayed! In recent years, many non-heritage cultures, such as ironwork, shadow puppetry, Sichuan opera face changing, and Hanfu culture, have gradually returned to the public in this popular way, and at the same time, this also provides a good opportunity for the development of other traditional crafts. Currently, there are various paths for the digital dissemination of NRL (e.g. VR museums, short video platforms, etc.), but mobile APPs have become the best carrier for balancing cultural depth and public participation due to their high user stickiness, interactive flexibility and popularity. This study selects user experience as the core to systematically address the problem of 'split between cultural expression and user needs' common to traditional handicraft APPs, and construct a 'culture-user' two-way driven design paradigm through the five-factor model of user experience, providing a model for similar projects. paradigm, providing a methodological reference for similar projects.

1.2. The development of Cizhou Kiln cultural

Cizhou Kiln burning pottery and porcelain history has a long history, created in the mid-North Song Dynasty and reached its peak, the Southern Song Dynasty, Yuan, Ming and Qing Dynasty were still continuations, with strong creativity and vitality.

1.2.1. Cizhou Kiln

The Cizhou Kiln, characterized as a distinctive folk kiln, was famous in the Ming and Qing dynasties as 'the best pottery and metallurgy in the world in Pengcheng', and the site of the kiln is located in Handan City, Hebei Province, China today. Cizhou Kiln burned porcelain, mostly bowls, plates, pots, pans, jars and other household utensils (Liu & Wu, 2022), because of the unique decorative techniques and styles, Cizhou Kiln porcelain not only sells well around the country, but also exported to Japan, North Korea, Southeast Asia and West Asia and other countries and regions.

1.2.2. A review of the heritage of Cizhou Kiln

Cizhou Kiln porcelain making techniques were passed down by word of mouth, usually through blood relations, but today's rapidly changing environment has led to a downturn in the income and development of the Cizhou Kiln porcelain making industry. Through an investigation to the Cizhou Kiln Art District and the Modern Art Museum, it was found that there are several reasons for the inheritance crisis facing the Cizhou Kiln as follows.

Cizhou Kiln production model is traditional, mainly family workshops and small enterprises, weak resistance to market risk, when the cold many small enterprises due to insufficient capital reserves in trouble. Shortage of funds for research and development to slow product updates, serious homogenization, vicious competition is frequent, many workshops on the verge of closure. Under the impact of modernization and industrialization, the traditional porcelain-making customs have changed, and it is difficult to integrate the existing forms of production and development into the contemporary environment (Gong et al., 2022).

Although Cizhou Kiln has a long history, it is not well known, mainly because of insufficient publicity. Modern life and aesthetic concept changes to Cizhou Kiln heritage challenges, its traditional porcelain in function, shape, decoration and modern demand is out of touch, difficult to meet the market (Ao et al., 2023). In this context, the digital heritage of Cizhou Kiln is crucial.

2. User experience design

User Experience (UX) is the experience that a product (including websites, software, mobile apps, physical products, etc.) gives to the people who use it in reality (Garrett, 2010). It involves all aspects of the user's interaction with the product, from the initial perception of the product, to the operational experience during use, to a series of evaluations after use, etc. Donald Norman proposed and popularized the concept of user experience, which gradually involves more and more fields, such as psychology, human-computer interaction, usability testing are included in the relevant fields of user experience (Norman & Draper, 1986). James Garrett proposed five levels of user experience, based on the process of people using the product, the five elements affecting the user experience are categorized from top to bottom: strategy layer, scope layer, structure layer, framework layer and performance layer, and that Web sites and interactive Web applications are more important as self-service than other types of products (Garrett, 2010).

3. Traditional crafts APP under user experience

In the face of the collision between old traditions and the new era, there have been many traditional handicraft APPs based on user experience.

3.1. APP under user experience

For example, representative Xinjiang products such as Adelie silk, carpets, small flower hats, and English knives were selected to help people understand the exquisite craftsmanship of Xinjiang by introducing the history and production process of each craft through the mobile application (Li et al., 2020). The 'Passing on the Art' App symbolizes the passing on and spreading of handicrafts. It is a lightweight mobile application product that creates a platform to connect artisans and the public for the exchange of traditional handicrafts (Qu et al., 2023).

To summarize, the development of APP interaction design in traditional handicrafts is gradually growing, and the combination of Cizhou Kiln culture and app has great feasibility, so it is also necessary to ride on the momentum.

3.2. Ceramic making APP under user experience

There are a number of ceramic products making related mini-games on the market today, such as 'Let's create! Pottery Lite' (Figure 1). In gamification applications, the ease-of-use element of the user experience has a significant impact on users' attitudes and continued use, and has an extremely critical influence on the market acceptance and promotional effectiveness of the app (Nugroho, 2024).

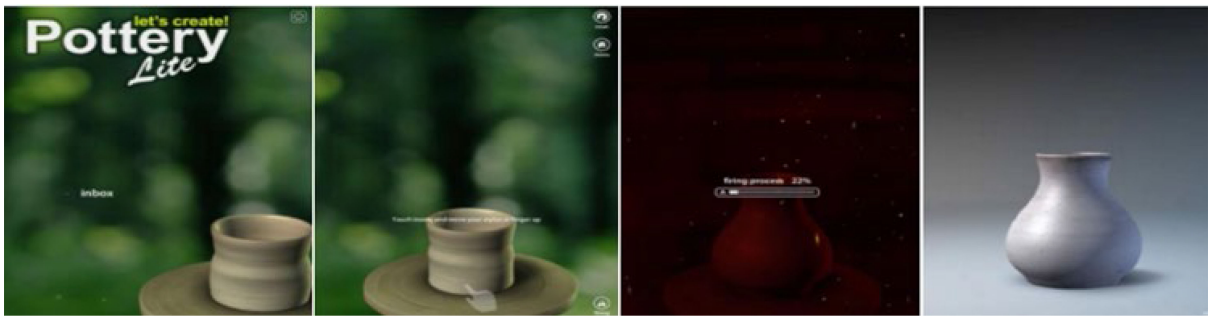

Figure 1. 'Let's create! Pottery Lite' screenshot

4. Interaction design of Cizhou Kiln APP under the 'Culture-UX Integration Framework'

In summary, this paper proposes the 'Culture-UX Integration Framework', aiming at solving the problem of disconnection between cultural expression and user needs, which is common in traditional handicraft APPs. Through a three-step core process (user demand mapping→cultural symbol extraction→interaction scene construction), the model deeply integrates non-heritage cultural symbols into user experience design to ensure a dynamic balance between cultural communication and functional ease of use.

The ‘Culture-UX Integration Framework’ is a systematic design framework and incorporates a five-part user experience model, starting with a strategy layer that focuses on product goals and user needs, i.e. what the product must do for people (Garrett, 2010). The second layer, the Scope Layer, includes the program’s functional specifications and content needs, i.e., what application features users need to achieve their goals. The structure layer, as the third layer, interaction design and information architecture are the core elements of this layer, and a clear hierarchical structure needs to be built. The fourth layer is the framework layer, which mainly completes the visualization of the product, i.e. interface layout design, navigation design and information design. The top layer is the performance layer, which mainly involves visual communication design, colour, font and other specific presentation forms (Figure 2).

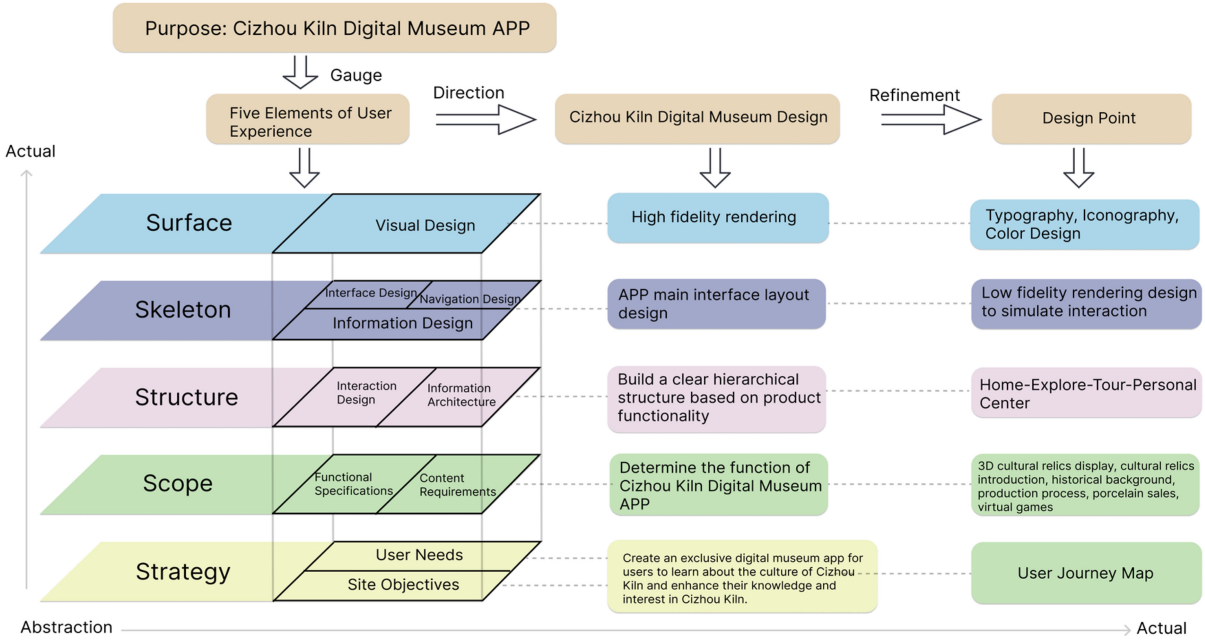

Figure 2. Cizhou Kiln App under the five elements model of user experience

4.1. Strategicy

The Cizhou Kiln Digital Museum strategy focuses on product goals and user needs, aiming to digitize its history, culture, art and craftsmanship for more users, and to promote the inheritance and promotion of traditional culture.

User requirements mapping: User journey mapping is a creative way to fast-track complex UX projects, allowing us to understand the relevant user processes and identify and plan the necessary UX activities in a short period of time before moving on to the user research stage (Endmann & Keßner, 2016). Visualize the user’s behavior (including virtual or physical experience) at a specific period of time. Focusing on tourism management students, the study analyses their interest in Cizhou Kiln culture and the process of using the app through a user journey mapping study. The journey map maps a process, represented visually in the Cizhou Kiln Digital Museum - from student access to services to final resolution (Samson et al., 2017) (Figure 4).

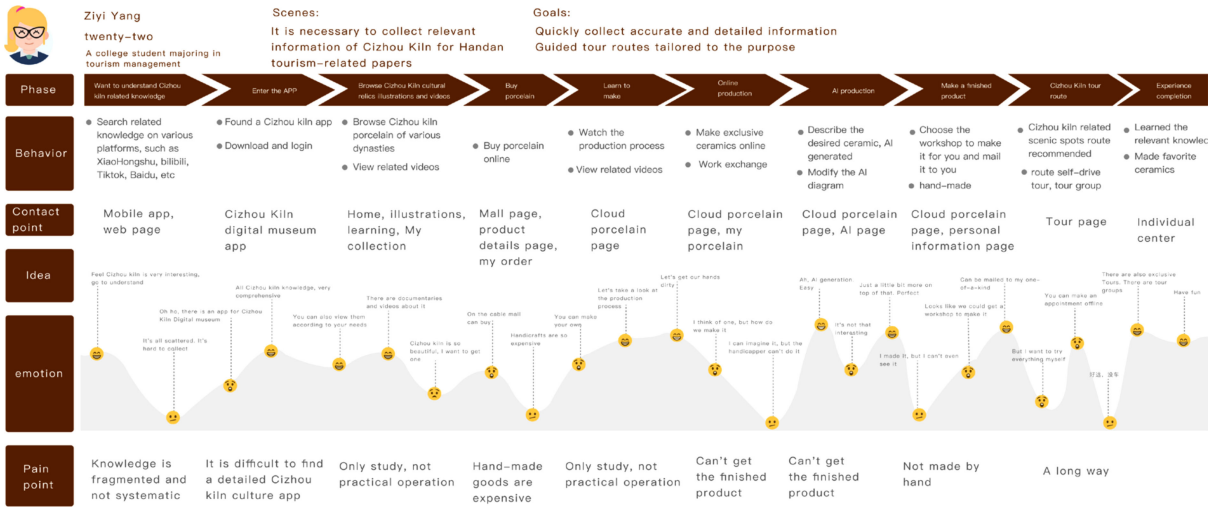

Figure 3. User journey Map

4.2. Scope

The scope layer of the Cizhou Kiln Digital Museum under user experience mainly focuses on the user's functional needs and content needs, and the design covers the functional needs of digital exhibitions, interactive experience zones and personalized recommendations. These functions not only include 3D display of cultural relics, detailed introduction of historical background and vivid presentation of production process, but also enhance the user's sense of participation and immersion through virtual games and other interactive methods. Meanwhile, the personalized recommendation system provides customized visit routes and learning contents according to users' interests and needs, further enhancing the user experience.

4.3. Structure

Cizhou Kiln Digital Museum has a clear information structure and smooth interaction design. The artifacts are categorized according to dynasties and shapes, and are displayed in a reasonable hierarchical structure, making it easy for users to browse and understand the museum. 'Personal information management' four core sections, each section carefully planned and designed to ensure that its content, function and purpose can meet the different needs and expectations of users (Chen, 2024) (Figure 4).

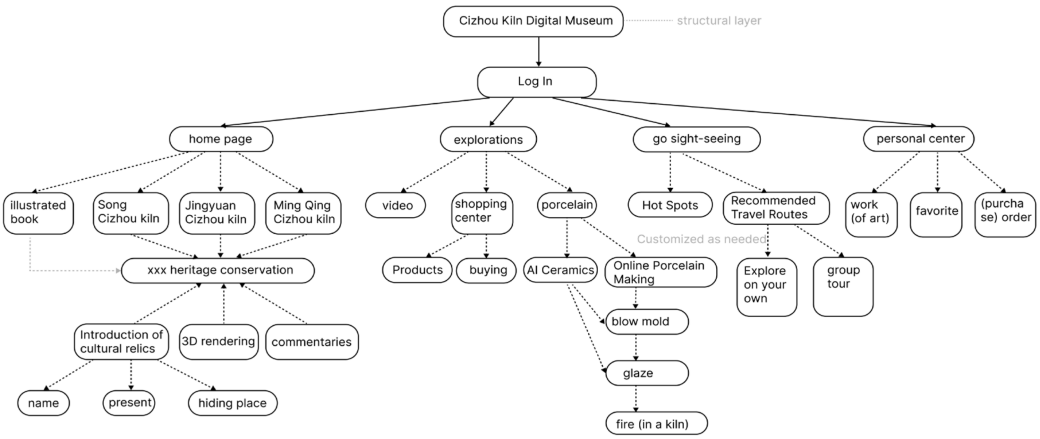

Figure 4. Cizhou Kiln digital museum structure

4.4. Skeleton

The framework layer mainly completes the interface visualization design, focusing on the aesthetics and ease of use of the interface, with a reasonable interface layout, clear and focused information display, so that users can easily access the required information. The framework layer further improves the structural layer, lays out the interface, and links each section to each other (Figure 5).

Figure 5. Cizhou Kiln digital museum frame floor

4.5. Surface

The performance layer of Cizhou Kiln Digital Museum is mainly for APP visual design, i.e., colour, interface, interaction and other specific presentation status. The font of this design adopts the Founder Yao font, which is long and thin, and is suitable for the characteristic porcelain vase with black flowers on white ground in Cizhou Kiln.

Cultural Symbol Extraction: The use of colours selects neutral tones based on the results of the questionnaire research and extracts the classic colour scheme of Cizhou Kiln's black flowers on a white ground (Figure 6), which not only strengthens the cultural recognition, but also reflects the universal value of 'regional colour symbols' in the visual design of the intangible cultural heritage APP. Future designers can learn from this method, such as incorporating the blue and white colour scheme of celadon porcelain and the enamel colour of cloisonné into the interface design.

Figure 6. Cizhou Kiln digital museum app color design

Four modules, Home, Explore, Tour, and Personal Centre, are designed with navigation bar icons extracting the cultural characteristics of Cizhou Kiln (Figure 7).

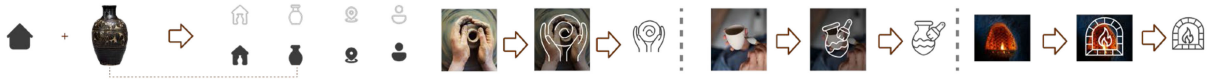

Figure 7. Icon Design

5. The interaction design of Cizhou Kiln digital museum

Home page: The first page features an illustrated guide to the artifacts, categorized by dynasty, and the artifacts are presented in a 3D panorama, which can be viewed by swiping up and down. In addition to dynasties, it can also be filtered by porcelain shape, and there is a search bar at the top to quickly locate what you need (Figure 8).

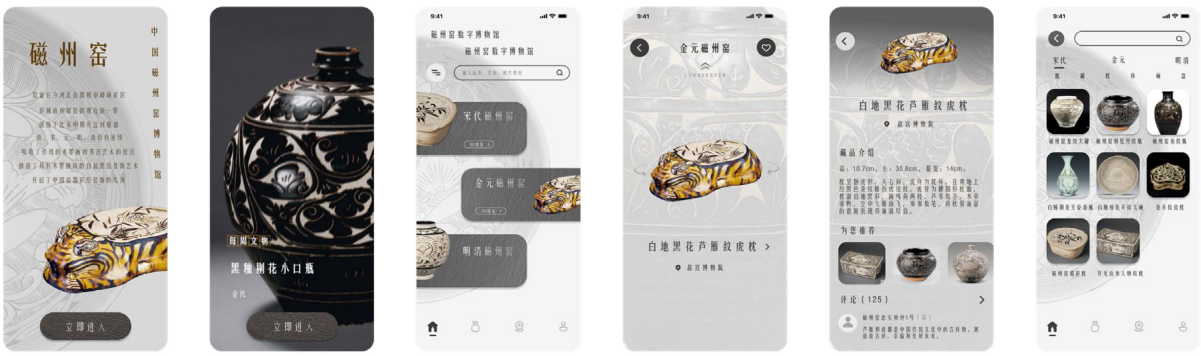

Figure 8. Home page

Explorations: Explore the interface including video, shopping centre and porcelain making. The video contains learning videos related to Cizhou Kiln. Mall has merchants selling products. Porcelain production is divided into AI porcelain production and personal online operation, the seventy-two processes are simplified to billeting, glazing, firing, the user can make their own, the finished product can be stored in the electronic map, but also offline handmade or find a workshop on behalf of the production of the mail (Figure 9).

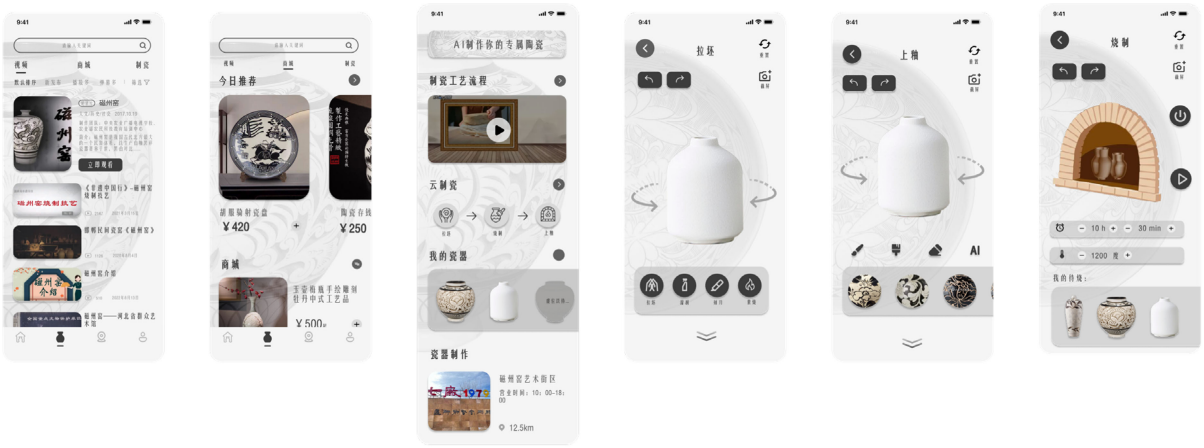

Figure 9. Explorations

Visit: When conducting Cizhou Kiln tourism activities, users can independently choose suitable tourist attractions or system-recommended tour routes according to their personal interests and needs. These choices can be based on the user's need for in-depth experience of the porcelain-making culture or their interest in browsing the rich cultural background of Cizhou Kiln. In this way, users can not only gain an in-depth understanding of the unique charm of the Cizhou Kiln, but also gain personalized experience and learning during the trip (Figure 10).

Personal Center: The user's DIY and AI-created works, favourite works in the collection, porcelain orders placed, and trips booked to the Cizhou Kiln are all in the personal information. In addition, users can provide feedback to the system for improvement and optimization.

6. Usability testing

The most widely accepted definition of usability is that in ISO 9241-11, which states that usability is 'the degree to which a system, product or service is used by a particular user to achieve a particular goal, as well as its effectiveness, efficiency and satisfaction, in a particular context of use' (Weichbroth, 2024). Sirpa Riihiaho in the paper 'Usability Testing', points out that Usability evaluation is an essential part of user-centred product development. Usability testing is performed without users. Usability testing is an evaluation method in which one or more representative users at a time perform tasks or describe their intentions under observation(Riihiaho, 2018).

6.1. Content of the test

Usability studies are used to test and improve technology prior to field testing (Frith, 2019), It is the level of usability from the user's point of view at which the product effectively, efficiently and satisfactorily achieves its goals. A product can be said to be efficient if the user is able to use the system in a way that accurately and completely meets his or her goals at a given time (Nugraheni et al., 2019). The goal of this study is to evaluate the ease of use, functionality and user experience of the Cizhou Kiln Digital Museum App, collect user feedback, identify potential problems, provide a basis for subsequent optimization and improvement, and ensure that the App can effectively meet the user's needs for exploring the culture of the Cizhou Kiln, touring and related interactions (Zhuang et al., 2022). This usability testing was conducted using a task evaluation methodology, where a task model describing the interactive system is used to collect, understand, and analyse user behaviours as they interact with the system in the early stages of a user-centred development cycle (Bernhaupt et al., 2019) (Figure 10). According to the main functions of the APP, it is divided into five tasks from the aspects of homepage illustration, exploring and learning, porcelain making, and touring, and the five tastes are numbered as A1-A5, and the data are

analysed in terms of task completion time, completion situation, and completion path to evaluate the usability of the APP of Cizhou Kiln Digital Museum (Figure 11).

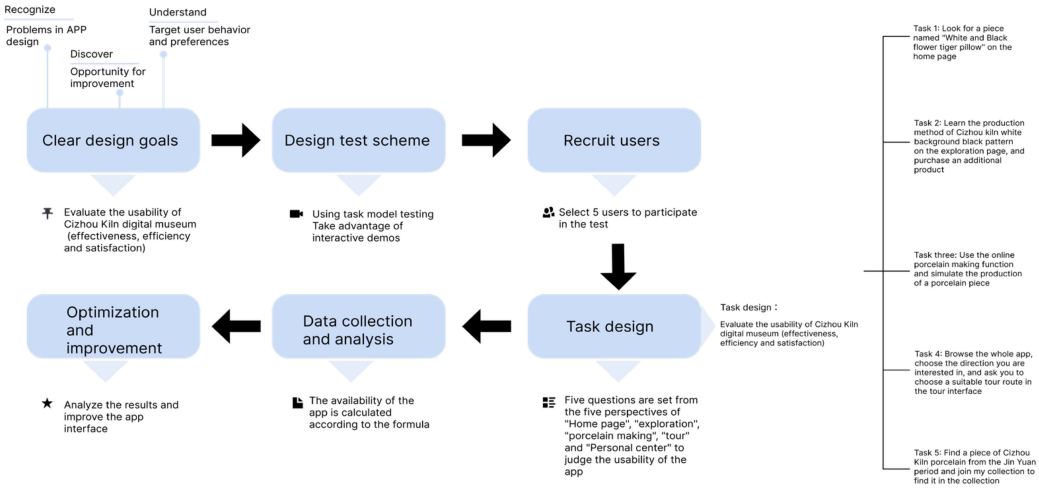

Figure 10. Cizhou Kiln Digital Museum App Usability Testing Flowchart

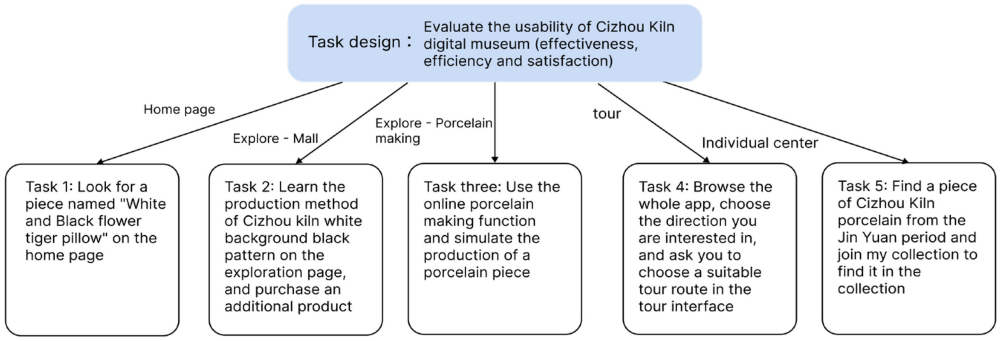

Figure 11. The framework of the testing tasks

6.2. Data analysis

The time limit for each task is 180 seconds. If you exceed the time limit, you will fail the task and go directly to the next one. The test results are shown in Figure 12.

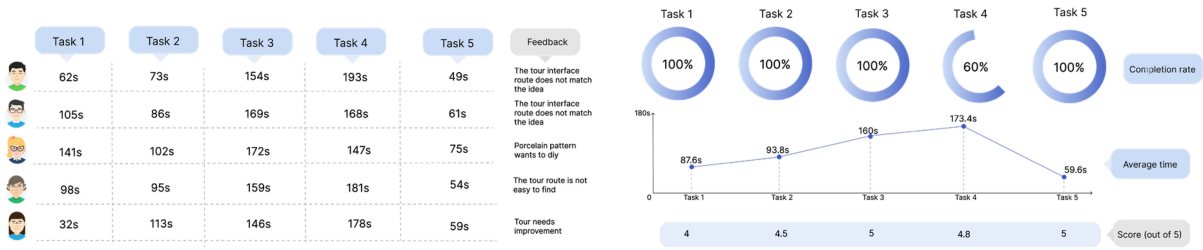

Figure 12. Usability data testing

The data shows that the completion rate of Task 1, Task 2, Task 3 and Task 5 is 100%, while the completion rate of Task 4 is 60%. The completion rate of Task 1 was 100%, but A3 took a long time. After further communication, it was found that it was not possible to quickly find the entrance to the icon, but it was possible to quickly find the target after help, reflecting the usability of the “icon” function in the “home page”. The success rate of task 4 was low. According to the feedback, the routes recommended in the “Tour” interface did not fully cover their needs and needed further improvement.

6.3. Interface design improvement

Based on the data analysis, the "Tour" section will be further improved by adding the function of asking users about their needs in the route interface, and the AI will match or formulate the route that best meets their needs, instead of relying on users to search on their own (Figure 13).

Figure 13. Tour interface improvement

7. Conclusion

Digitization is one of the most dynamic trends and methods of sharing and understanding traditional Chinese cultural exchanges for users and audiences around the world in this day and age (Zhang et al., 2019). This thesis focuses on the design of Cizhou Kiln app based on user experience, aiming at designing an app that meets users' expectations, is easy to operate and can fully display the culture of Cizhou Kiln through in-depth analysis of users' needs and behavioral characteristics, and combining the cultural connotation and artistic characteristics of Cizhou Kiln. In the process of the research, rich data and information were obtained through field survey, market research, and other methods, and the "Culture-User Experience Integration Model" was put forward, which provides solid theoretical support and practical guidance for the design of the app.

In terms of design practice, following the user-centered design concept, through the process of 'user demand mapping→cultural symbol extraction→interaction scene construction', the APP function and experience are continuously optimized and improved from the user's demand through interface design, interaction design and other links, which not only provides a systematic solution for digital communication of Cizhou Kiln culture, but also opens up a reusable methodological path for the design of APPs of other intangible cultural heritages. This not only provides a systematic solution for the digital dissemination of the Magnetic Zhou Kiln culture, but also opens up a reusable methodology path for the APP design of other intangible cultural heritage. The paper will expand the sample for a longitudinal study in the future, and the results will be published as a full-length article.

Acknowledgment

This paper is sponsored by the project No. kyqd016 supported by Sichuan Normal University.

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