



Developing a Participatory Digital Platform Model for the Preservation of Paju Opera
in Shan Xi, China

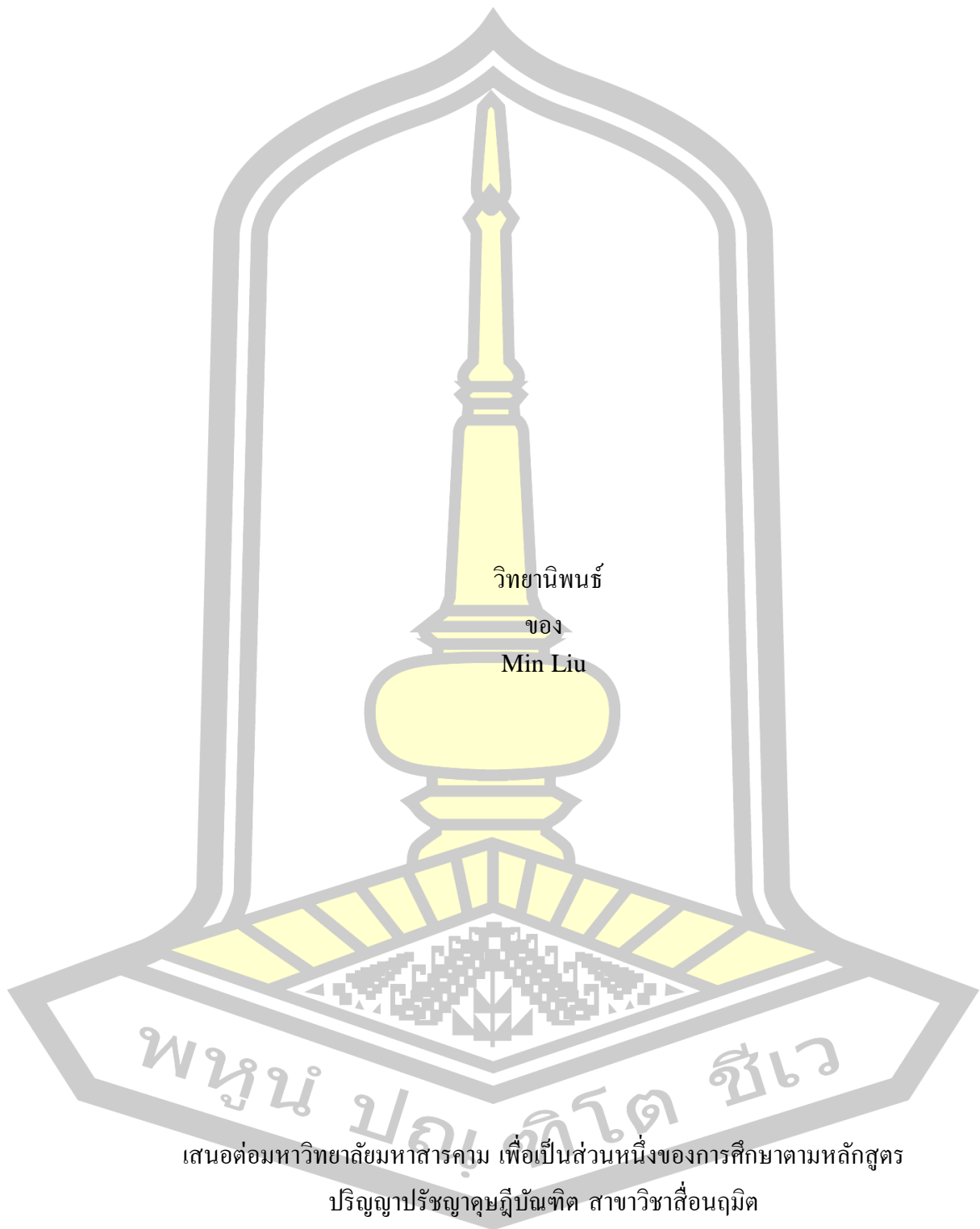
Min Liu

A Thesis Submitted in Partial Fulfillment of Requirements for
degree of Doctor of Philosophy in Creative Media

May 2025

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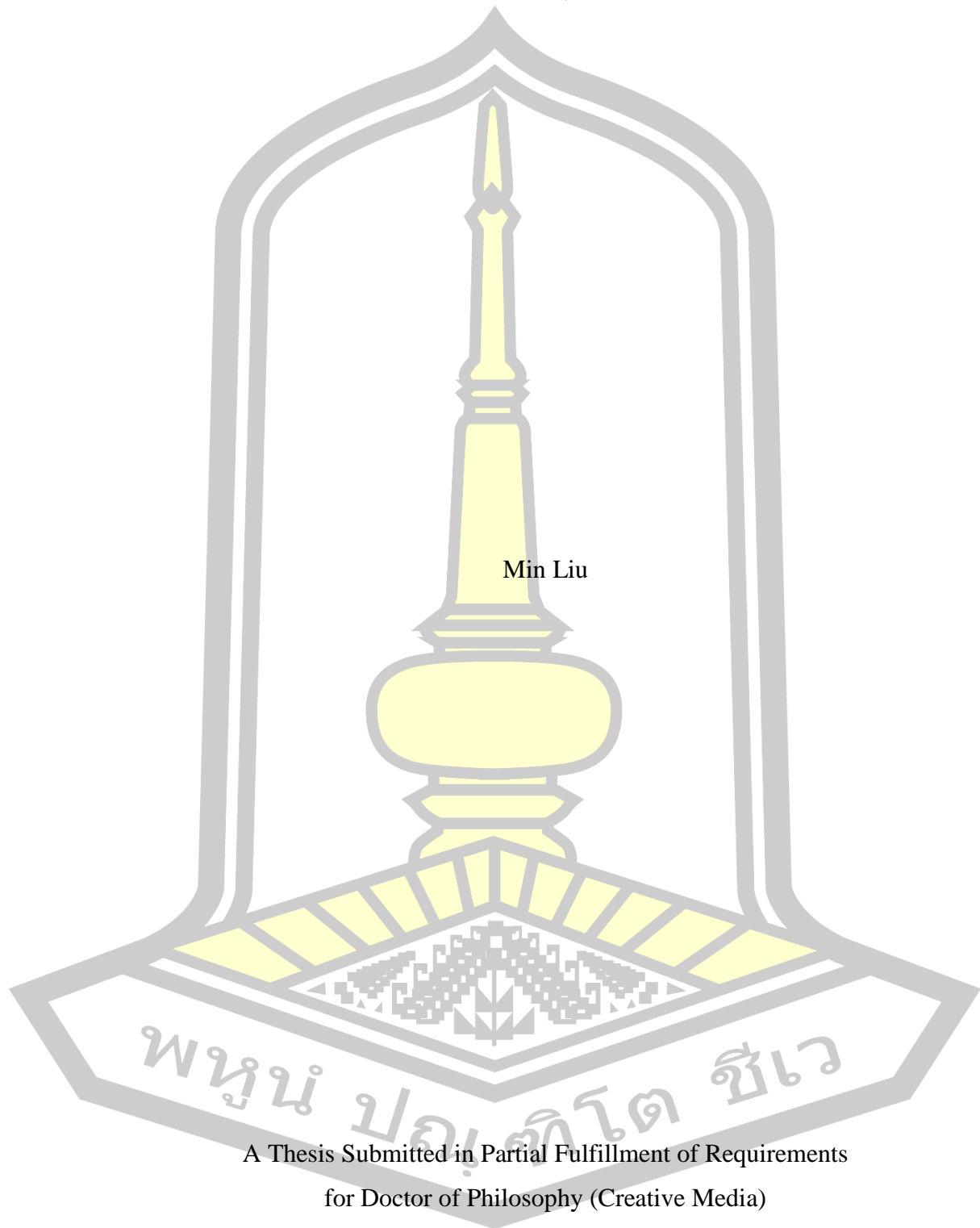


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May 2025

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ABSTRACT

Puju Opera, a significant cultural heritage in Shan Xi, China, faces challenges in preservation due to declining audience engagement and generational disconnect. Traditional conservation efforts struggle to attract younger audiences, necessitating innovative digital solutions. A participatory digital platform can bridge this gap by fostering interaction and community-driven preservation. This study aimed to: (1) study the essential components of participatory digital platforms for preserving Shan Xi's Puju Opera in China, (2) develop a participatory digital platform model for the preservation of Puju Opera in Shan Xi, China, (3) evaluate the quality of a participatory digital platform model for the preservation of Puju Opera in Shan Xi, China, and (4) evaluate the perception of audiences towards Puju Opera on a participatory digital platform. The research employed a mixed-methods approach and involved two groups of participants.

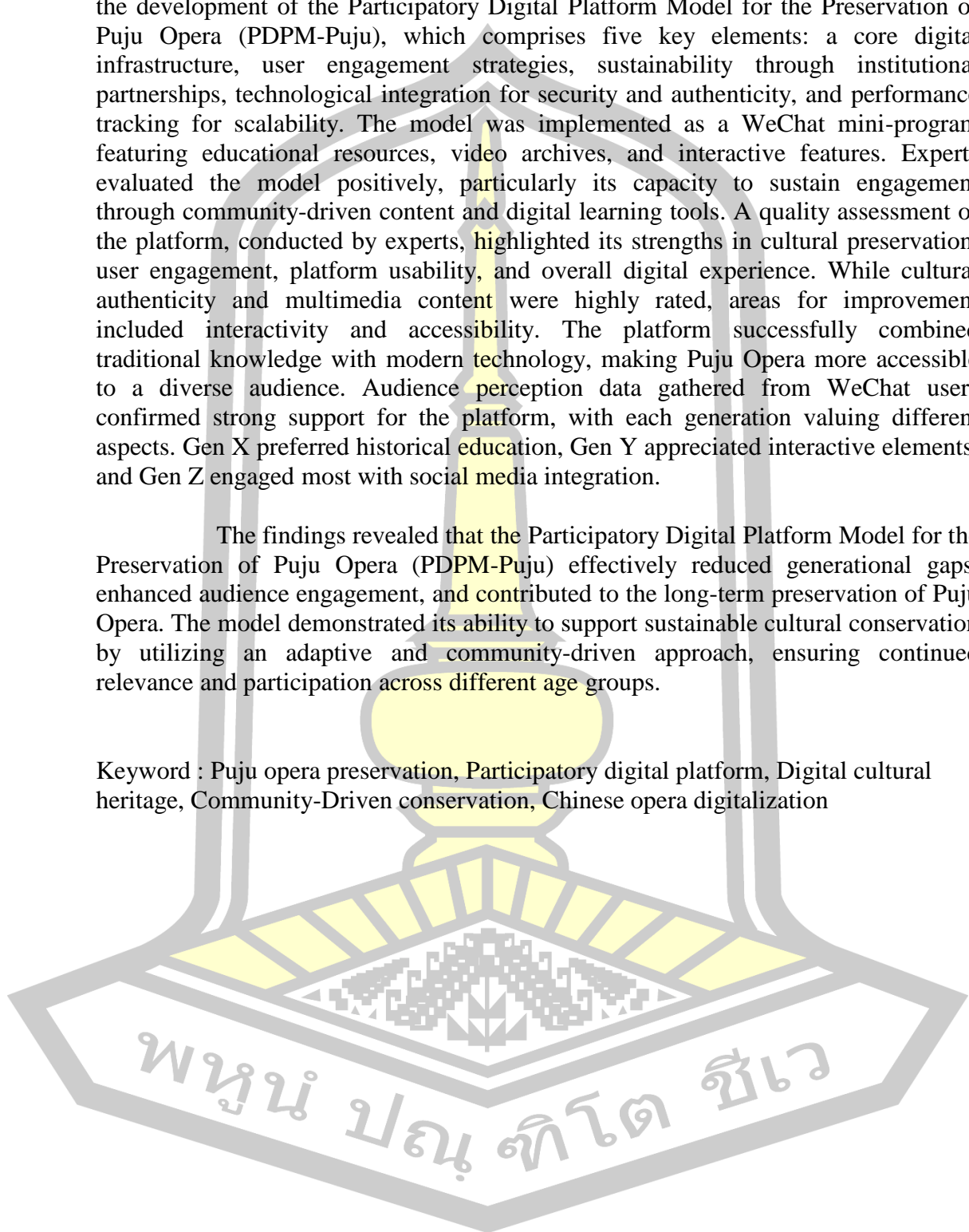
The first group consisted of 512 WeChat users who provided insights into the essential components of participatory digital platforms for Puju Opera preservation, with data collected through both online and on-site methods. The second group comprised 413 participants who evaluated their perceptions of Puju Opera through the application on the participatory digital platform, with data collected exclusively online. Both groups participated voluntarily. The data collection instruments included (1) a survey questionnaire, (2) in-depth interviews, (3) a model suitability assessment, (4) an application quality assessment, and (5) an audience perception evaluation. Quantitative data were analyzed using percentage, mean, and standard deviation, while qualitative data were analyzed through content analysis.

The study explored the key components necessary for developing a participatory digital platform for preserving Puju Opera in Shanxi, China. Audience opinions from three generations-Gen X, Gen Y, and Gen Z-highlighted the importance of historical documentation, multimedia integration, social media connectivity, and gamification. While Gen X prioritized cultural accuracy and structured content, Gen Y emphasized interactive and multimedia elements, and Gen Z favored social engagement and dynamic experiences. Expert interviews reinforced these findings, stressing the need for AI-powered search tools, user-generated content,

and institutional collaborations for long-term sustainability. The research resulted in the development of the Participatory Digital Platform Model for the Preservation of Puju Opera (PDPM-Puju), which comprises five key elements: a core digital infrastructure, user engagement strategies, sustainability through institutional partnerships, technological integration for security and authenticity, and performance tracking for scalability. The model was implemented as a WeChat mini-program featuring educational resources, video archives, and interactive features. Experts evaluated the model positively, particularly its capacity to sustain engagement through community-driven content and digital learning tools. A quality assessment of the platform, conducted by experts, highlighted its strengths in cultural preservation, user engagement, platform usability, and overall digital experience. While cultural authenticity and multimedia content were highly rated, areas for improvement included interactivity and accessibility. The platform successfully combined traditional knowledge with modern technology, making Puju Opera more accessible to a diverse audience. Audience perception data gathered from WeChat users confirmed strong support for the platform, with each generation valuing different aspects. Gen X preferred historical education, Gen Y appreciated interactive elements, and Gen Z engaged most with social media integration.

The findings revealed that the Participatory Digital Platform Model for the Preservation of Puju Opera (PDPM-Puju) effectively reduced generational gaps, enhanced audience engagement, and contributed to the long-term preservation of Puju Opera. The model demonstrated its ability to support sustainable cultural conservation by utilizing an adaptive and community-driven approach, ensuring continued relevance and participation across different age groups.

Keyword : Puju opera preservation, Participatory digital platform, Digital cultural heritage, Community-Driven conservation, Chinese opera digitalization



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Min Liu

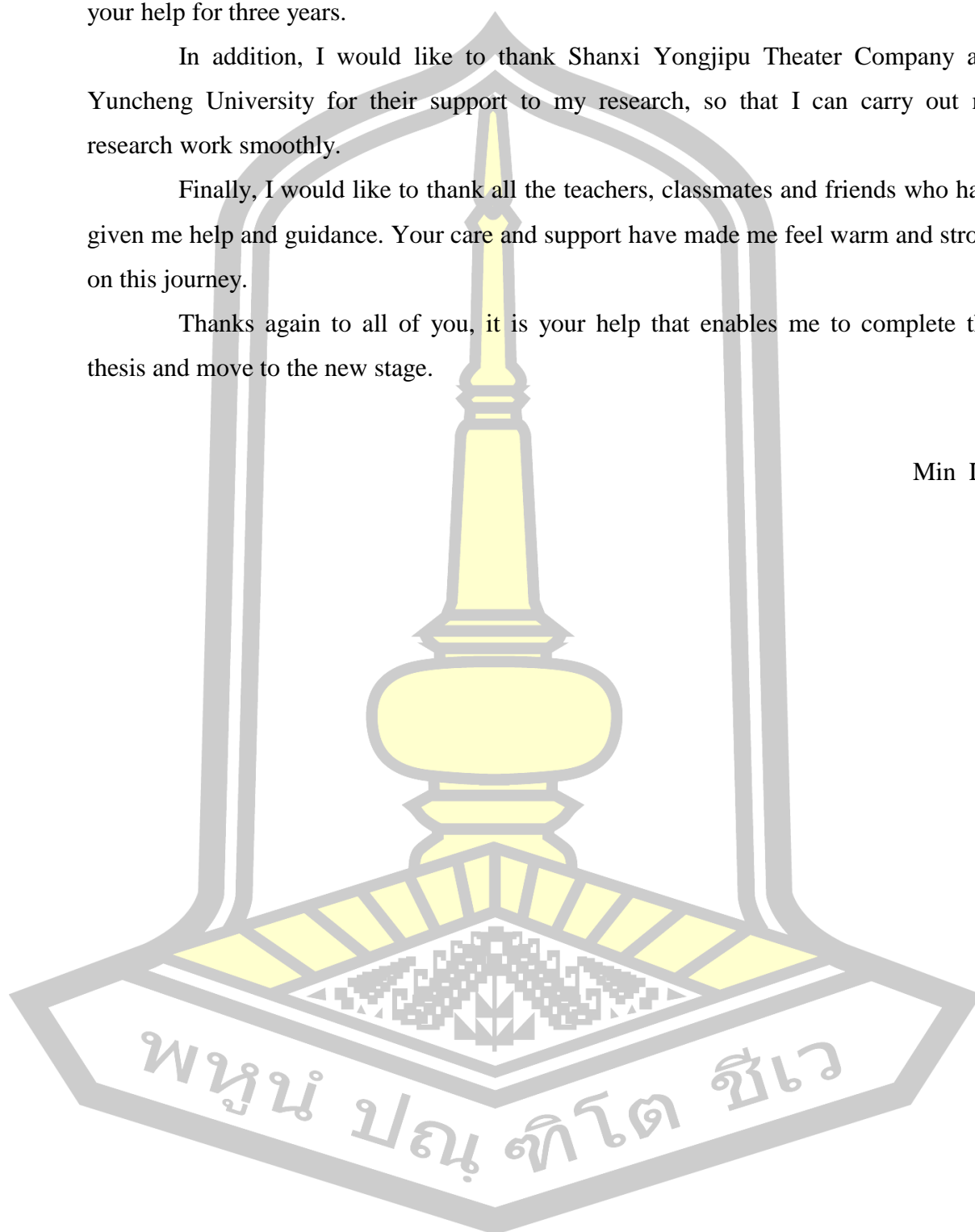


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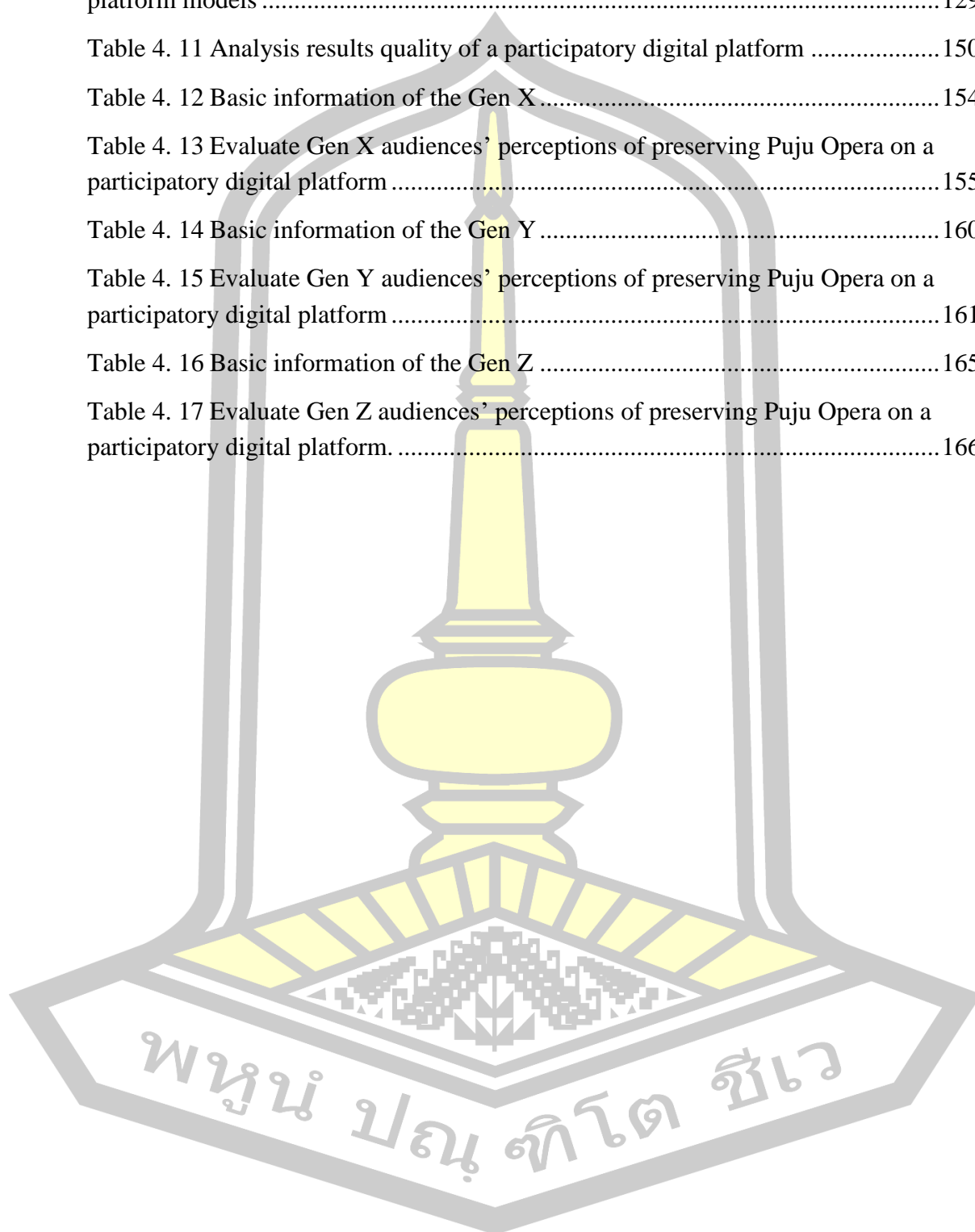
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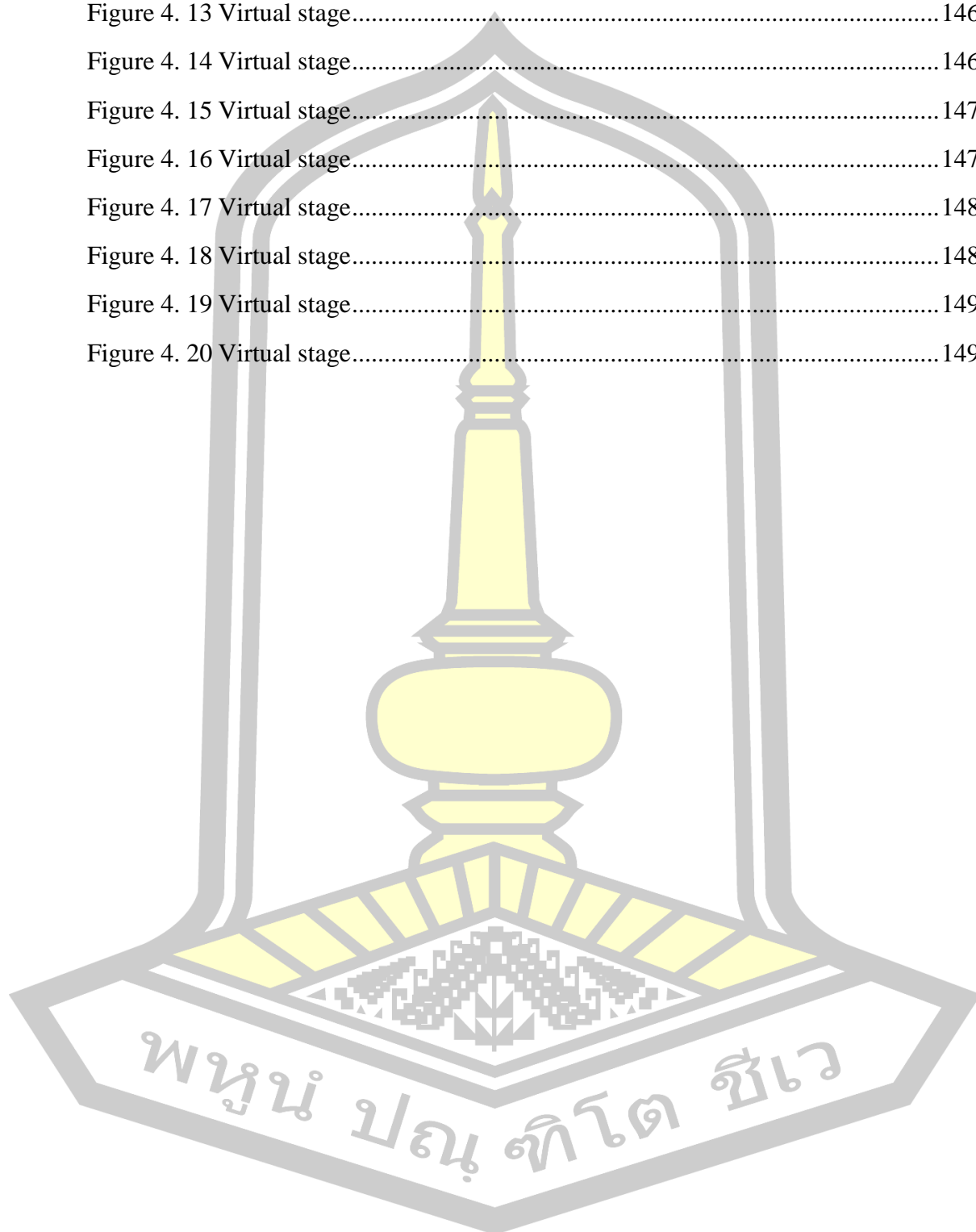
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CHAPTER 1

Introduction

1.1 Research Background

The preservation of traditional cultural heritage is of utmost importance in maintaining the rich tapestry of human history and diversity. In this context, the Puju Opera holds a significant place in the cultural landscape of Shan Xi, China. Puju Opera is a traditional form of Chinese musical theater that combines singing, acting, and traditional instrumentation to tell stories from Chinese history and folklore. (Li Nan,2022). Opera is an ancient dramatic art form with a long lasting charm. Puzhou Opera, known as "Puzhou Clapper Opera" in ancient times, is one of the ancient operas of Chinese Clapper Opera. It got its name because it originated in Yongji in the southwest of Shaanxi Province. In 2006, Pu Opera was included in the first batch of national intangible cultural heritage list. Shanxi Puju at the same time in Yuncheng, Linfen two also relatively popular. At present, a total of 13 counties (districts) have their own Pu troupes. (Puzhou Bangzi Editorial Board, 2007) Opera troupe was founded on September 15, 2011, December 31, 2020, Pu Opera Art Research Institute (formerly Yuncheng Pu Opera Troupe), Pu Opera Education and training Research Institute (formerly the city Youth opera experimental group), Pu Opera Music and Dance Research Institute (formerly the city Art Troupe) and the city culture and art school four public institutions "school group integration". (Puzhou Bangzi Editorial Committee, 2007).

Shan Xi Puju Art Academy (Yuncheng City Culture and Art School) was established. After the establishment of Shan Xi Puju Art Academy, it set "teaching, research, creation, performance and management" as one of the responsibilities, and found an outlet for solving the development dilemma of art schools. Shan Xi Puju Opera Art Academy has also set up a famous teacher studio, Yuncheng seven Plum Blossom Award actors all settled in, the formation of a famous teacher inheritance class, the implementation of the opera students free recruitment policy. (Puzhou Bangzi Chronicles Compilation Committee,2007). However, Puju Opera, like many other traditional art forms, faces numerous challenges that threaten its preservation

and continuity in the modern era. One of the primary challenges is a dwindling audience and a lack of engagement, especially among younger generations. As society becomes increasingly digital and fast-paced, younger individuals are often drawn to more contemporary forms of entertainment, leaving traditional art forms like Puju Opera with an aging and shrinking audience base. (Yang&Lu,2020)

The new era Pu opera communication faces four difficulties, 1) the development of the troupes was limited, and the government gave each group 500,000 yuan for the salary of the actors, and in more cases, the troupes had to rely on their own performances to maintain their basic operations. 2) Traditional audiences have been lost because most of them are in rural areas, where life is tight and there is no money to buy tickets or invite troupes to perform in villages. Puju Opera loyal fans audience is older, do not have the strength to go to the theater to see the play. (Chang & Chen, 2019). 3) The death or retirement of the old entertainers in Pu Troupe makes some troupes lose their core competitiveness, and the representative repertoire is not passed on; Middle-aged actors have high performance level but high pressure, but some troupes have different ages and performance levels. 4) The popularity of the mass media has diversified the way fans watch the theater. From wechat video accounts and Douyin live streaming, the ways and platforms for fans to watch operas are diverse. All these factors have a huge impact on the Pu opera market, especially the use of new media technology for TV stations to hold live broadcasts, and it has become less and less important for fans to go to the show. (Yang Jingjing,2023).

Inheriting the essence of Puju opera, storing the internal power, telling the local stories well, injecting the connotation of The Times, keeping the innovation and promoting the creative transformation and innovative development of Pu opera are the guidelines for the protection of Puju opera, such as establishing the accumulation and training mechanism of opera talents, perfecting the creation mechanism of plays, enriching performance resources, increasing publicity and promotion, and cultivating the audience. Furthermore, the intergenerational transmission of Puju Opera knowledge and skills is at risk due to a lack of effective platforms for knowledge exchange. Master performers and practitioners of Puju Opera are aging, and the younger generation is often less interested in dedicating the time and effort required to learn and perform this intricate art form. To compound these challenges, the geographical limitations of Puju

Opera performances limit their reach. Performances typically take place in specific theaters or venues within Shan Xi, making it difficult for individuals outside the region to experience and appreciate this cultural treasure (Smith, 2023). In light of these issues, there is an urgent need to develop an innovative engagement model that leverages digital platforms to preserve and promote Puju Opera in Shan Xi and beyond. This model should address the following key aspects. The audience engagement that this model attracts and engages with a younger audience through digital means makes Puju Opera relevant and engaging based on their preferences and habits. Digital platforms can breathe new life into cultural heritage. Studies by (Gao & Li, 201). Showcase how dynamic digital presentations and cross-media campaigns can reinvigorate traditional art forms, sparking curiosity and appreciation among both local and global audiences. Interactive content creation can bridge generational gaps and engage younger audiences. Jones et al., (2019). highlight the importance of augmented reality and virtual reality experiences to enhance the audience's understanding of the art form. Such immersive technologies offer a fresh perspective on Puju Opera's intricate techniques and stories. (Chen Guangyu,2018).

Here's how the researchers explain how digital platforms can be used as a way to protect popular dramas. New digital platforms emerge in the form of apps, where users log into specific local websites and use AR virtual technology, with the support of hologram, artificial intelligence and other technologies, with the help of 5g high-definition, multi-angle real-time transmission technology, cross-regional virtual on-site participation is realized, and another version of the continuation of the dream is created for the audience. To realize the combination of Pu opera and new technology, users can realize the form of Pu opera costume change and stage based on the traditional role classification of "face changing technology, cross-dressing, clothing pattern, freehand, and decorative characteristics", or based on the creative design points of traditional roles of Pu opera, stand on the virtual stage to sing opera, and extract the design strategy and design transformation of Pu opera content. Analyze stage art, stunt performance, clothing pattern, hair and makeup, regional culture, etc., select the specific elements of Pu opera culture, sell through creative design products, and design practice. Using AR technology, 3D object recognition technology, 3D

digital modeling and other technologies, the traditional universal historical memorial hall space is digitally presented. The history of Puzhou can be restored and "live"! (Hanqi,2018).

This research successfully creates a participatory digital platform model, which can be applied to the performing arts of other dramas besides the preservation of Pu opera. With the spread of new media technology, other operas, such as Peking Opera, Yu Opera, Huangmei Opera, etc., have taken the lead in spreading on digital platforms, such as using Douyin live broadcast, the second phase of the second season of Famous Corner DOU is Coming. The first season of the show, launched in 2022, brought together seven genres of Peking Opera, Yu Opera, Huangmei Opera, Yue Opera, Cantonese Opera, Qinqiang Opera and Kunqu Opera, 12 national first-class actors and six Plum Blossom Award winners, and garnered 170 million online views. The second season plans to better serve opera celebrities and actively help professional actors open up online stages through one-on-one exclusive operation, live traffic support, and personal debut shows. Therefore, this kind of digital platform has been successfully applied in other operas and achieved good results. On this basis, the digital platform studied by me will increase the autonomy of the audience, that is, it can allow the audience to use AI virtual technology to dress in operas and break the local restrictions to perform jointly with the audience in different regions on the virtual stage. (Yang Jingjing,2023) .

Education and transfer of knowledge, skills, and techniques of Puju Opera to the new generation. Intergenerational knowledge transfer is a critical concern for preserving traditional art forms. In the preservation of traditional art forms, one critical concern is the intergenerational transmission of skills. (Wang&Lee, 2018). propose online mentorship programs as a strategy, allowing experienced practitioners to guide young learners virtually. This approach not only ensures the continuity of essential skills but also fosters personal connections between generations. This strategy not only ensures skill continuity but also nurtures personal connections between generations. The creation of intergenerational collaboration is instrumental in knowledge transmission. Collaborative where younger artists work alongside masters to reinterpret traditional performances in contemporary contexts, attracting diverse audiences (Yang & Lu, 2020).

Digital engagement strategies are instrumental in revitalizing traditional art forms. Studies (Lee & Kim, 2017) emphasize the use of social media, live streaming, and interactive apps to foster active participation and knowledge exchange. Engaging narratives and gamification techniques enhance audience interaction and retention (Chang & Chen, 2019). To ensure the continuity of this art form Reduce geographic restrictions It enables people outside of can have experience and participate in activities related to Puju Opera. There is a new cultural convergence in combining Puju Opera with modern cultural discourse and collaboration. to be consistent with contemporary styles and concepts Build sustainability to ensure conservation efforts are self-sustaining and able to adapt to technological and social changes.(Chang & Chen, 2019)

In summary, the challenge lies in finding a way to bridge the gap between the traditional art form of Puju Opera and the digital age. Creating a form of participation that not only preserves the essence of this cultural heritage but also keeps it alive and relevant for generations. That will happen both in Shan Xi and beyond.

1.2 Research Question

1.2.1 What are the key components required for the design of a participatory digital platform aimed at preserving Shan Xi's Puju Opera?

1.2.2 How can a participatory digital platform model be quality developed to support the preservation of Puju Opera in Shan Xi?

1.2.3 What criteria should be used to assess the quality of the participatory digital platform model designed for Puju Opera preservation in Shan Xi?

1.2.4 How do audiences perceive and engage with Puju Opera through a participatory digital platform?

1.3 Research Objectives

1.3.1 To study the essential components of participatory digital platforms for preserving Shan Xi's Puju Opera in China.

1.3.2 To develop a participatory digital platform model for the preservation of Puju opera in Shan Xi, China.

1.3.3 To evaluate the quality of a participatory digital platform model for the preservation of Puju opera in Shan Xi, China.

1.3.4 To evaluate the perception of audiences towards Puju Opera on a participatory digital platform.

1.4 Definition of Terms

1.4.1 Puju Opera

A traditional opera form that combines traditional singing, acting, and Musical Instruments to depict stories from Chinese history and folklore. There are important cultural and historical values of Shan Xi Province of China.

1.4.2 Preservation

For the protection, preservation and preservation of cultural traditions, customs and artefacts for future generations. The background of this study refers to efforts to ensure continuity and support for the Puju Opera House as a digital platform and people of cultural heritage.

1.4.3 Participatory

The process of acquiring and maintaining interest; Personal attention and involvement. In this study, participation involved establishing a connection between viewers and popular dramas through a digital platform called Tiktok

1.4.4 Digital Platforms

Digital platform: refers to online channels. In this study, people tried the WeChat, which promotes interaction, communication and content sharing through digital means. These platforms include social media.

1.4.5 Participatory Digital Platform Model

A new framework or approach aimed at implementing new strategies for enhancing connectivity using digital platforms and the relationship between stakeholder engagement.

1.4.6 Effectiveness

Make sure that your digital platform engagement model can attract viewers and get satisfactory usage, both to spread and promote Puju opera, but also to continue to spread Puju opera.

1.4.7 Shan Xi in China

A province in northern China. It is characterized by its rich cultural heritage and historical significance. It is the geographical context for the focus of conservation research.

1.5 Research Scope

1.5.1 Population

The study targeted 2 main groups:

1) General Audience: Divided into three generational groups:

1.1) Gen X (45–60 years)

1.2) Gen Y (29–44 years)

1.3) Gen Z (13–28 years)

2) Experts in Five Key Fields: Provided insights and evaluations on platform components and quality, including:

2.1) Puju Opera specialists

2.2) Digital platform developers

2.3) Cultural conservationists

2.4) Digital communication specialists

2.5) Anthropologists/social science researchers

1.5.2 Sample Group

Three main participant groups were selected:

Group 1: WeChat Audience (≥ 400 participants) – Contributed data on essential platform components, sampling Method: Convenience Sampling (based on accessibility and willingness to participate).

Group 2: Application Testers (≥ 400 participants) – Tested the Puju Opera Digital Platform on WeChat, sampling Method: Stratified Sampling (divided by Gen X, Gen Y, and Gen Z).

Group 3: Expert Panel (9 participants) – Provided expert evaluations, sampling Method: Purposive Sampling (selected based on professional expertise).

This structured approach ensured diverse perspectives from both audiences and experts, enabling a comprehensive evaluation of the participatory digital platform model for Puju Opera preservation in Shanxi, China.

1.5.3 Research Variables

The research includes 6 variables, as follows:

- 1) Factors influencing the identification of essential components for a participatory digital platform for Puju Opera preservation
- 2) The essential components of participatory digital platforms for preserving Shan Xi's Puju Opera in China.
- 3) The participatory digital platform model for Puju opera preservation in Shanxi, China.
- 4) Appropriateness a participatory digital platform model for the preservation of Puju opera in Shan Xi, China.
- 5) The quality of a participatory digital platform model for the preservation of Puju opera in Shan Xi, China.
- 6) The perception of audiences towards Puju Opera on a participatory digital platform.

1.5.4 Research Tools

- 1) In-depth interviews with Shanxi community members and experts on the essential components of a participatory digital platform for the preservation of Puju Opera in Shanxi, China.
- 2) Audience opinion assessment form on the essential components for developing a participatory digital platform for the preservation of Puju Opera in Shanxi, China.
- 3) A participatory digital platform model for the preservation of Puju Opera in Shanxi, China.
- 4) Appropriateness assessment form for the participatory digital platform model.
- 5) A participatory digital platform for the preservation of Puju Opera in Shanxi, China, developed based on the identified model framework.
- 6) Application quality assessment form for the participatory digital platform.
- 7) Audience perception assessment form on Puju Opera on the participatory digital platform.

CHAPTER 2

Literature Review

Have the researcher review related literature to add and expand the elements, procedures, and application of theoretical principles in research. Existing Theoretical Frameworks to be Preserved and Extended by Students:

2.1 Digital platform

Preserving traditional art forms like Puju Opera while embracing the digital age necessitates a thoughtful approach that balances tradition with innovation. This guideline outlines key principles and strategies to effectively leverage digital platforms for the preservation of Puju Opera:

2.1.1 Digital platform means

- 1) It is necessary to adhere to local conditions, comprehensively use methods such as panel interviews, random interviews, questionnaires, expert surveys, sample surveys, and statistical analysis, and make full use of modern information technologies such as the Internet and big data to carry out investigations and research, and improve scientific and practical results.
- 2) Digital technology to improve the scientific research, digital technology t Digital platform save the cost of research, digital technology is also one of the contents of research.
- 3) To carry out research, it is necessary to find the intersection of digital technology

2.1.2 Benefits of digital platforms

The development and governance of the business environment of digital platforms has shown five new characteristics, such as "sub-differentiation of the boundary of the rights and responsibilities of the main body", "increasingly scenario-oriented, industry-oriented and intelligent business formats", and "focusing on digital layered governance in response to new risks", "increasing cooperation with the digital governance of public affairs" and "using digital technologies such as AI to protect the rights and interests of consumers".

2.1.3 Types of digital platforms

Based on the functional classification, it can be divided into transactional platform, social platform and innovative platform. Transactional platforms provide digital platforms for both parties in need of transactions, with the aim of helping different types of individuals and organizations complete transactions. The social platform is mainly a digital platform for users to create and exchange content, enhance social communication with each other, and strengthen similar views, usually called social media. Innovative platforms are referred to as technical platforms, which are primarily digital infrastructure platforms for application developers to innovate and develop complementary software products.

2.1.4 Important elements of a digital platform

- 1) The era of big Party A of "I say you listen" has passed, abandon the thinking of "big Party A" and find "big Party B" to build a digital platform through "co-creation mode" cooperation.
- 2) About the investment: do not only consider the cost of functional development, do not consider the cost of operations and maintenance
- 3) About the building steps: small steps are better than one move
- 4) Make sure you know what the core goal is before you start, okay
- 5) Digital platform construction is not a functional list, the structure is very important

2.1.5 Digital platforms and digital products

Our digital platform and products mainly focus on four aspects: smart park, smart community, digital village and digital factory. In addition, we summarize in five aspects: digital platform, digital government, digital application, network data information security and network analysis system and system integration, and other Internet of Things applications

2.1.6 The distinctive characteristics of digital platforms

- 1) Product architecture design is reasonable
- 2) The technical architecture is strong, and the operational function is the foundation
- 3) Business leaders need to gradually understand the steps, infrastructure and necessary elements of digital platforms, so that they can use tools to better empower their work in the digital age.

2.1.7 Digital platform capabilities

Building internal platforms has become an important way for supplier enterprises to achieve digital transformation, but how to integrate external digital capabilities with internal business capabilities to form digital platform capabilities is still lacking. Through the longitudinal case analysis of five leading supplier enterprises in building internal platform, the paper probes into the construction path and formation mechanism of digital platform capability. The study found:

1) Digital platform capability construction follows the evolution path of "platform basic capability - platform application capability - platform composite capability", showing the advanced characteristics of "horizontal expansion - vertical promotion".

2) Digital-business" capability gradually realizes the integration of "space - cross-domain - structure" through three strategies of "transplant - debugging - embedding", so as to promote the final formation of digital platform capability. The research conclusion opens the "black box" of digital platform capability of manufacturing enterprises, enriches and expands the relevant literature of digital platform capability construction and capability integration strategy, and has guiding significance for manufacturing enterprises to build internal platforms to accelerate digital transformation.

2.1.8 Sustainability and Iterative Improvement

1) Establish a long-term vision for the digital engagement model, ensuring its adaptability to evolving technologies and audience preferences.

2) Continuously gather user feedback and data to refine the engagement model, making improvements based on user interactions and engagement patterns.(Liu, J., Ning, L. and Gao, Q,2023).

By adhering to this guideline, the development of a novel engagement model for the preservation of Puju Opera can strike a harmonious balance between tradition and digital innovation. The guideline provides a structured approach to leverage the power of digital platforms to ensure the continuity and vibrancy of Puju Opera for generations to come.

2.1.9 Analysis of Key Components of Participatory Digital Platforms

This analysis of the key components of participatory digital platforms serves as a guideline for developing a digital platform model aimed at preserving Puju Opera in Shanxi Province, China, as illustrated in Table 2.1.

Table 2. 1 Analysis of Key Components of Participatory Digital Platforms

Component	Component	Source (s)	Commonality	Distinctiveness	Interconnections	Objective	Applicability to Puju Opera
1. Digital Archives & Learning Ecosystem	1.1 Digital Archives & Multimedia Documentation	Giaccardi (2020); Kenderline & Favro (2021)	Widely recognized as foundation of digital heritage preservation	Combines archival depth with multimedia formats	Supports education and authenticity	Preserve and provide access to cultural records	Crucial for archiving scripts, costumes, and video
	1.2 Virtual & Live Performances Reenactment	Holdgaard & Simonsen (2020); Damala (2021)	Frequent in cultural performance digitization efforts	Blends real-time and recorded performance modes	Links performance with memory	Revive and simulate traditional performances	Useful for reenacting lost or rare performances
	1.3 Interactive Heritage Learning & Tutorials	Gonzalez-Tennant (2021); Parry et al. (2022)	Common in education-focused heritage platforms	Enhances learning through user interaction	Fuels engagement via tutorials	Educate audiences about heritage interactively	Ideal for teaching about Puju traditions
2. Gamified User Engagement & Social Storytelling	2.1 Gamified Experiences & Challenges	Hamari et al. (2020); Seaborn & Fels (2021)	Popular in interactive heritage games and apps	Links entertainment with cultural	Reinforces participation and motivation	Engage users through playful cultural	Engages youth via game-like elements

Component	Component	Source (s)	Commonality	Distinctiveness	Interconnections	Objective	Applicability to Paju Opera
				education		experiences	
	2.2 User-Generated Storytelling & Co-Creation	Jenkins et al. (2020); Liu & Zhang (2023)	Central to participatory cultural content	Empowers community-driven content	Links co-creation with archival evolution	Encourage active content co-creation	Encourages storytelling from the Paju community
	2.3 Social Media & Hybrid Participation Events	Papacharissi (2021); Wang & Ma (2024)	Common in hybrid participatory campaigns	Bridges online and offline public participation	Connects communities and stories	Increase reach and participation	Promotes events and audience participation
3. Sustainability, Partnerships & Policy Advocacy	3.1 Multi-Stakeholder Partnerships & Funding	UNESCO (2021); Taylor & Zhang (2022)	Typical in cultural sustainability models	Secures diverse funding and network support	Sustains platforms through collaboration	Ensure platform longevity and impact	Secures funds for platform operation
	3.2 Academic, Cultural & Civic Collaboration	Smith & Akagawa (2021); Gao et al. (2023)	Often seen in transdisciplinary heritage projects	Fosters synergy among knowledge sectors	Enhances trust and knowledge sharing	Create cross-sectoral knowledge ecosystems	Links scholars, artists, and citizens
	3.3 Policy Advocacy & Public Awareness	Kurin (2022); Chan & Li (2023)	Unique to civic and public awareness policy pushes	Drives political engagement in heritage	Bridges heritage with governance	Promote policy change and awareness	Advocates Paju heritage in policy spaces
4. Advanced Technologies & Data Trust Management	4.1 Immersive Technologies: AI, VR, AR Integration	Bekele et al. (2021); Slater et al. (2022)	Frequent in immersive heritage experiences	Offers multisensory experience for engagement	Boosts engagement and memory retention	Provide rich and engaging cultural immersion	Enriches understanding of Paju aesthetics

Component	Component	Source (s)	Commonality	Distinctiveness	Interconnections	Objective	Applicability to Puju Opera
5. Performance Analytics & Universal Scalability	4.2 Blockchain for Data Trust & Provenance	Zwitter & Boisse-Despiaux (2020); Mougayar (2021)	Emerging but increasingly adopted	Ensures data provenance and authenticity	Protects user-generated content integrity	Ensure transparent digital heritage traceability	Verifies source material authenticity
	4.3 Privacy & Security Compliance	GDPR Guidelines (2020); Kesan & Hayes (2022)	Standard in secure digital system designs	Aligns with global digital privacy regulations	Builds user trust and system legitimacy	Maintain platform and user data security	Protects sensitive user and cultural data
	5.1 Real-time Performance Analytics & User Feedback	Koofi et al. (2021); Zhao & Liu (2024)	Integral to user-centered platform feedback	Enables iterative user experience improvements	Drives platform refinement	Optimize platform usability and effectiveness	Improves audience insight and feedback
	5.2 Global Expansion & Localization	Sotamaa & Karppi (2021); Li & Wang (2023)	Key for reaching diverse global audiences	Adapts content to local contexts and customs	Facilitates global participation	Enable content use across regions	Supports future international exhibitions
	5.3 Cross-Cultural & Multilingual Support	Deacon & Tam (2022); Xu et al. (2024)	Vital for inclusive and accessible platforms	Supports multilingual and multicultural engagement	Promotes inclusive digital experiences	Serve linguistically diverse users	Bridges language barriers for wider outreach

The analysis of key components reveals a comprehensive and interdependent structure necessary for the successful development of a Participatory Digital Platform Model dedicated to the preservation of Puju Opera in Shanxi, China. Five core domains emerged from the synthesis: Digital Archives & Learning Ecosystem, Gamified User Engagement & Social Storytelling, Sustainability, Partnerships & Policy Advocacy, Advanced Technologies & Data Trust Management, and Performance Analytics & Universal Scalability. Each of these domains encompasses distinctive components that collectively support cultural preservation, community participation, and long-term platform impact.

1. Digital Archives & Learning Ecosystem ensures the systematic documentation, reenactment, and interactive education of Puju Opera, supporting both traditional preservation and innovative access methods. These elements are foundational, offering authenticity, accessibility, and pedagogical value for local and global audiences.

2. Gamified User Engagement & Social Storytelling fosters meaningful interaction, particularly among younger users and diaspora communities. By incorporating co-creation and social media participation, the platform empowers users to become active agents in cultural transmission.

3. Sustainability, Partnerships & Policy Advocacy supports operational longevity through multi-stakeholder collaboration, public awareness, and cultural policy engagement. These components ensure the platform remains socially embedded and financially viable.

4. Advanced Technologies & Data Trust Management enables immersive experiences through AI, VR, and AR while addressing data security and provenance. These technologies elevate the cultural experience while reinforcing trust and transparency in heritage data.

5. Performance Analytics & Universal Scalability provides feedback loops and supports global reach, ensuring iterative platform improvements and cross-cultural adaptation—critical for expanding Puju Opera’s relevance beyond regional boundaries.

In conclusion, the integration of these components allows for the construction of a holistic, scalable, and culturally sensitive digital platform. It not only preserves

the tangible and intangible dimensions of Puju Opera but also encourages dynamic participation and co-ownership among diverse user groups.

Summary of Analysis Table 2.1, the analysis reveals that components such as Comprehensive Digital Archives, Crowdsourced Content & Digital Storytelling, and AI, VR, & AR Integration are common across various sources, emphasizing their foundational role in participatory digital platforms. Distinctive elements like Cultural Policy Advocacy and Global Expansion highlight opportunities for broader impact and scalability. The interconnections among these components—such as how technology enhances user engagement, which in turn supports sustainability—underscore the importance of a holistic approach. Each component serves specific objectives, from preserving cultural artifacts to engaging communities and securing funding, all of which are crucial for developing a robust platform for Puju Opera preservation.

2.2 Participation theory concept

2.2.1 Participation meaning

Interaction is a form of participation, its significance is to promote the audience's participation and active learning, has reached a deep understanding and learning of Pu opera, and finally can spread and preserve Puju opera.

2.2.2 importance of participation

Participation is very important, only active participation, can be involved in the world around us can provide the opportunity to learn and practice new skills, can be more in-depth study of Puju drama, better appreciation of Pu drama.

2.2.3 Participation principles

1) The participation principle begins with the end, and the effective participation principle is backward from the output goal. To achieve the goal of efficiency.

2) The participation principle can be a powerful tool for workshop efficiency

You can teach courses according to Puju opera experts or Puju opera actors, master skills, and learn Puju opera performance efficiently.

3) The participation principle constitutes the temperament of the field

Puju opera performance needs a certain field temperament, such as what role you want to learn, you can follow the study of performance, you want to learn is flower or Wu Dan, you need to learn the temperament of this role in place.

2.2.4 Participation formats and procedures

Participate in the form of Puju opera digital platform communication, mainly log in to the LAN, after logging in, you can use such equipment to visualize the performance, such as this is a glass, you can use AI technology to see the virtual world, you can choose your favorite clips and Pu opera actors, click on the work to learn, And on the virtual stage, audiences from different regions can perform together on the virtual stage.

2.2.5 Level of participation

Participation is the degree to which any individual likes to pay for a thing. The more the audience likes the communication form of the digital platform, the higher the participation. On the contrary, when we can see the higher the participation of the audience, the higher the new digital model

2.2.6 Participation conditions

You need to have an Internet connection, enter a Web address, and buy a device, and put on the glasses inside the device, you can see the virtual world. Dress up in Puju opera and learn Puju opera fragments.

2.3 Technology and Performing Arts Preservation

A review of the literature on the role of technology in promoting, revitalizing, and preserving performing arts and cultural heritage reveals a significant shift in the methods used for conservation and cultural access through digital media. Scholars have explored and discussed the meaning, significance, applications, and impacts of technology in advancing, restoring, and safeguarding traditional performing arts, as summarized below.

2.3.1 Definition

The application of technology in the preservation of performing arts refers to the use of digital tools-such as virtual reality (VR), augmented reality (AR), interactive media, online platforms, and digital archives to document, transmit, and foster public engagement with traditional performance practices. These tools enable

the preservation of both tangible and intangible elements of performing arts, ensuring they remain accessible and meaningful for future generations (Liu et al., 2024; But, 2024).

2.3.2 Significance

Technology plays a vital role in preventing the loss of cultural practices that may not have been formally documented. It creates new opportunities for younger audiences to engage with heritage content through accessible and immersive formats. Moreover, it supports intercultural education and global knowledge exchange. For example, a digital preservation project focusing on Qinhuai River shadow puppetry successfully utilized VR and archival methods to deepen user understanding through experiential learning (Liu et al., 2024).

2.3.3 Advantages and Limitations of Technology in Performing Arts Preservation

1) Advantages

1.1 Increased Accessibility: Online platforms allow global audiences to explore and experience local performances regardless of location (Omelebele, 2024).

1.2 Enhanced Engagement: VR and AR provide more immersive and interactive experiences than conventional video recordings, helping users form a deeper emotional connection with the art form (Dima et al., 2024).

1.3 Preservation of Intangible Elements: Digital technologies can capture nuanced performance techniques, gestures, and performer-audience dynamics (Vrettakis et al., 2019).

2) Limitations

2.1 Risk of Displacement: There is concern that virtual experiences may diminish interest in attending live performances (But, 2024).

2.2 Technical and Resource Constraints: Long-term data storage, technological maintenance, and production costs remain significant challenges.

2.3 Authenticity Risks: Without expert oversight, there is a danger of misrepresenting cultural content or oversimplifying complex traditions (Liu et al., 2024).

2.3.4 Cultural Impact of Technology in Performing Arts Preservation

1) Positive Impacts

1.1 Encourages intergenerational learning and participation in cultural heritage.

1.2 Raises international awareness of endangered performing arts traditions.

1.3 Supports sustainable archival systems through digital storage and retrieval technologies.

2) Potential Negative Impacts

2.1 May distort cultural identity if traditional content is overly modified or repackaged for digital consumption.

2.2 Could lead to superficial engagement if technological features overshadow cultural depth and spiritual meaning.

Table 2. 2 Analysis of Technology and Performing Arts Preservation

Main Theme	Subtopics / Applications	Consistency Across Sources	Differences / Unique Insights	Implications for Performing Arts Preservation
Immersive Technology for Preservation	Use of VR/AR to recreate performance environments	VR/AR are consistently seen as effective for enhancing engagement (Liu et al., 2024; Dima et al., 2024)	Liu et al. focus on shadow puppetry, while Dima et al. address decolonizing heritage sites	VR/AR can offer dynamic engagement tools, useful in reviving stage performances
Digital Archives & Online Platforms	Use of cloud-based archives and virtual exhibitions	All sources emphasize accessibility and archival value (But, 2024; Liu et al., 2024; Omelebele, 2024)	Some emphasize user interaction (Vrettakis et al., 2019), others emphasize data structure	Digital platforms extend reach and preserve content beyond physical constraints
Cross-Cultural Education & Access	Global access to performances and cultural materials	Cultural education is a common goal (Vrettakis et al., 2019; Omelebele, 2024)	Varies in target audience focus – some emphasize youth, others general audiences	Can serve as tools for intergenerational cultural transmission

Main Theme	Subtopics / Applications	Consistency Across Sources	Differences / Unique Insights	Implications for Performing Arts Preservation
Challenges of Digital Preservation	Technological obsolescence, data integrity, and collaboration	Challenges in long-term use are acknowledged across studies (Dima et al., 2024; But, 2024)	Degree of technical depth and scope of risk differ across articles	Highlight importance of ongoing technical support and ethical curation
Sustainable and Inclusive Approaches	Models for maintaining archives, community participation	Several sources mention the need for collaborative and adaptable models (Omelebele, 2024; Liu et al., 2024)	Different emphasis on community roles—some technical, others social-policy based	Supports models that integrate education, funding, and community-based input

Summary Table 2.2, analysis of Technology and Performing Arts Preservation

The matrix analysis synthesizes key themes from recent scholarly and empirical studies on the application of digital technology in the preservation of performing arts. It reveals five major dimensions that are highly relevant to the development of a participatory digital platform model for Puju Opera in Shanxi, China:

1. Immersive Technology for Preservation

Technologies such as virtual reality (VR) and augmented reality (AR) are widely recognized for their capacity to recreate traditional performance spaces and deepen user engagement. These tools can effectively bring Puju Opera to life for younger generations through simulations and interactive storytelling, making them valuable assets in revitalizing interest in traditional performance arts (Liu et al., 2024; Dima et al., 2024).

2. Digital Archives and Online Platforms

Across multiple studies, the creation of cloud-based digital archives and virtual exhibitions is emphasized as a critical method for safeguarding cultural content. These archives allow for long-term storage, organized access, and global dissemination of Puju Opera materials—including scripts, costumes, music, and video recordings (But, 2024; Omelebele, 2024).

3. Cross-Cultural Education and Access

Scholars highlight the value of digital platforms in expanding access to cultural knowledge across generations and borders. Tools such as mobile digital storytelling and multilingual interfaces help audiences—both domestic and international—understand the historical and aesthetic dimensions of traditional arts (Vrettakis et al., 2019; Omelebele, 2024).

4. Challenges of Digital Preservation

Despite the advantages, the literature also identifies challenges such as technological obsolescence, data integrity, and the need for interdisciplinary collaboration. Ensuring that digital reproductions maintain cultural authenticity and that archival systems are sustainable over time is essential for platforms aiming to preserve art forms like Puju Opera (Dima et al., 2024; But, 2024).

5. Sustainable and Inclusive Approaches

Studies advocate for participatory, community-driven, and policy-supported models. Successful preservation initiatives often combine funding mechanisms (e.g., freemium models, grants) with partnerships involving cultural institutions, academic bodies, and the local community. Such inclusive models are especially important for culturally embedded art forms like Puju Opera (Liu et al., 2024; Omelebele, 2024).

Implication for Research, these insights provide a theoretically grounded and practically relevant foundation for the development of a participatory digital platform model for Puju Opera. By integrating immersive technologies, creating a dynamic archival system, ensuring broad access, addressing sustainability challenges, and promoting stakeholder involvement, the platform can serve both as a cultural preservation tool and a medium for education and engagement.

2.4 Digital Platforms for Cultural Heritage Preservation

Digital platforms have become instrumental tools in the preservation and promotion of cultural heritage. Digital repositories, interactive websites, virtual exhibitions, and multimedia presentations have been used effectively to showcase traditional arts to wider and geographically diverse audiences. These platforms enable engagement beyond physical constraints, enhancing accessibility and facilitating the transmission of knowledge to new generations:

2.4.1 Contextual Relevance

Digital platforms should be chosen and designed in a way that aligns with the unique characteristics, narratives, and cultural significance of Puju Opera. The content presented on these platforms should authentically represent the essence of Puju Opera, ensuring that the traditional art form's identity is preserved and accurately portrayed.

2.4.2 Interactive Presentation

Utilize interactive elements to engage users on digital platforms. Incorporate multimedia content such as videos, audio clips, images, and virtual experiences that allow users to explore Puju Opera's visual and auditory aspects. Interactive storytelling, 360-degree virtual tours, and augmented reality can provide immersive experiences that captivate users' attention.

2.4.3 Education and Knowledge Sharing

Digital platforms should serve as educational resources, offering in-depth insights into the history, stories, characters, and techniques of Puju Opera. Utilize informative articles, videos, and tutorials to provide users with the opportunity to learn and understand the intricacies of Puju Opera.

2.4.4 Community Engagement

Foster a sense of community among Puju Opera enthusiasts, practitioners, and learners by creating online spaces for discussions, interactions, and collaborations. Forums, social media groups, and live Q&A sessions can facilitate knowledge exchange and create a platform for sharing experiences and insights.

2.4.5 Skill Transmission and Collaboration

Develop strategies to facilitate the transmission of Puju Opera skills and techniques from experienced practitioners to younger generations. This could involve live streaming of workshops, masterclasses, and collaborative projects that encourage intergenerational knowledge transfer.

2.4.6 Accessibility and Inclusivity

Ensure that the digital platforms are user-friendly and accessible to a wide range of audiences, including individuals with different levels of familiarity with Puju Opera and varying degrees of digital literacy. Consider language options, subtitles, and user guides to accommodate diverse users.

2.4.7 Continuous Content Updates

Keep the digital platforms dynamic and engaging by regularly updating content. Introduce new stories, behind-the-scenes insights, interviews with practitioners, and interactive challenges to maintain users' interest and encourage them to revisit the platform.

2.4.8 Feedback and Iteration

Encourage users to provide feedback on their experiences with the digital engagement model. Use this feedback to refine and improve the platform's features, content, and functionalities over time.

2.4.9 Balancing Tradition and Innovation

Strike a balance between honoring the traditional aspects of Puju Opera and embracing innovation facilitated by digital platforms. The engagement model should respect Puju Opera's cultural heritage while finding innovative ways to engage contemporary audiences.

These guidelines offer a comprehensive approach to utilizing digital platforms for the preservation of Puju Opera. They emphasize authenticity, interactivity, education, community building, and inclusivity while ensuring that the digital engagement model remains aligned with the cultural heritage of Shan Xi, China.

2.5 Shan Xi in China

2.5.1 Administrative area

Shan Xi, because it is located in the west of Taihang Mountain and named, referred to as "Jin", also known as "Three Jin", known as Hedong in ancient times, the capital city of Taiyuan. Shan Xi is bounded by the Taihang Mountains in the east, the Luliang Mountains and the Yellow River in the west and south, and the Great Wall in the north, with Hebei, Henan, Shaanxi, Inner Mongolia and other provinces and regions, and Liu Zongyuan called it "the mountains and rivers in the outside". Shan Xi is one of the birthplaces of the Chinese nation, Shan Xi has a written history of three thousand years, known as the "cradle of Chinese civilization", known as the "museum of ancient Chinese culture". With a total area of 156,700 square kilometers, Taihang Mountain in the east and Luliang Mountain in the west, the mountainous area accounts for more than 80% of the total area of the province. The outline of Shan Xi

administrative region is slightly parallelogram from northeast to southwest, with jurisdiction over 11 district cities, 117 county-level administrative units (25 municipal districts, 11 county-level cities, 81 counties), and a total population of 37.1834 million (at the end of 2017). The geographical coordinates of the jurisdiction are 34°34' ~40°44' north latitude and 110°14' ~114°33' east longitude. (Puzhou Bangzi Chronicles Compilation Committee,2007)

2.5.2 Terrain

Shan Xi is a typical mountainous plateau with extensive coverage of loess. The terrain is high in the northeast and low in the southwest. Most of the area is above 1500 meters above sea level, the highest point is the main peak of Wutai Mountain Yedou peak, 3061.1 meters above sea level, the highest peak in North China, known as the "roof of North China"; The lowest point in Yuanqu County Xiyang River into the Yellow River, only 180 meters above sea level. The interior of the plateau is undulating, and the valley is vertical and horizontal, and the landform types are complex and diverse, including mountains, hills, platforms and plains, with more mountains and hills and less rivers. The area of mountains and hills accounts for 80.1% of the total area of the province, and the area of plains and valleys accounts for 19.9% of the total area. The main mountains in Shan Xi; Taihang Mountain, Luliang Mountain, Hengshan Mountain, Wutai Mountain, Zhongtiao Mountain, Taiyue Mountain and so on. Shan Xi has Datong, Xinzhou, Taiyuan, Linfen, Yuncheng, Changzhi, Jincheng, Yangquan, Shouyang, Xiangyuan, Licheng and other basins. (Puzhou Bangzi Chronicles Compilation Committee,2007).

2.5.3 Climate

Shan Xi Province has a temperate continental monsoon climate. Shan Xi Province is located in the middle latitude area of the inland, in the climate type belongs to the temperate continental monsoon climate. Due to the influence of solar radiation, monsoon circulation and geographical factors, the climate of Shan Xi has the characteristics of four distinct seasons, synchronous rain and heat, sufficient sunlight, significant difference between the north and the south, wide temperature difference between winter and summer, and large temperature difference between day and night. (Puzhou Bangzi Chronicles Compilation Committee,2007).

The annual average temperature in Shan Xi Province ranges from 4.2°C to 14.2°C, the general distribution trend is increasing from north to south, and decreasing from the basin to the mountain. The annual precipitation in the province ranges from 358-621 mm, with uneven seasonal distribution. The precipitation from June to August in summer is relatively concentrated, accounting for about 60% of the annual precipitation, and the distribution of precipitation in the province is greatly affected by terrain. (Puzhou Bangzi Chronicles Compilation Committee,2007).

2.5.4 Population

According to the 2021 census, the population of Shan Xi Province is 34.80.00 million(Li Yingyue,2015).

2.5.5 Religion

There are five religious groups in Shan Xi Province, namely Buddhism, Taoism, Islam, Catholicism and Christianity, with about 1.85 million believers.

2.5.6 Arts and culture

Shan Xi has a long and profound history, and the folk customs here are the traditional history handed down by the local for thousands of years. It is the cultural heritage of the motherland, and its unique form and strong atmosphere contain the heritage of Chinese culture. There are many kinds of folk art and culture in Shan Xi, such as Shan Xi folk songs, Shan Xi gongs and drums, Shan Xi opera, Shan Xi New Year pictures and so on.(Li Yingyue,2015).

2.6 Case Studies in Cultural Engagement via Digital Means:

Several successful case studies underscore the potential of digital platforms in the engagement and preservation of traditional arts. Initiatives such as virtual museums, interactive storytelling apps, and online workshops have demonstrated the ability to captivate younger audiences while honoring cultural heritage. These case studies serve as inspirations for developing innovative engagement models tailored to the unique aspects of Puju Opera:

2.6.1 Selection of Case Studies

1) Diversity: Choose a range of case studies that reflect various approaches, goals, and target audiences within the realm of cultural engagement through digital platforms.

2) Relevance: Ensure that the selected case studies are relevant to the context of Puju Opera preservation and resonate with the challenges and objectives outlined in your research.

2.6.2 Data Collection

1) Documentation: Gather relevant documents, reports, articles, and digital content associated with each case study. This could include project descriptions, user feedback, engagement metrics, and any available evaluations.

2) Interviews: Conduct interviews with key stakeholders involved in the development and execution of each case study. This might include creators, practitioners, audience members, and technology experts.

2.6.3 Analysis and Evaluation

1) Engagement Strategies: Identify and analyze the digital engagement strategies employed in each case study. Consider interactive features, multimedia elements, user-generated content, and community-building efforts.

2) Audience Impact: Evaluate the effectiveness of each case study in engaging different audience segments. Assess whether the strategies succeeded in attracting traditional enthusiasts and younger generations.

3) Skill Transmission: Examine how each case study addressed the challenge of intergenerational skill transmission and knowledge sharing. Evaluate the methods used to convey traditional techniques in a digital format.

4) Technological Integration: Analyze how digital technologies were integrated into the case studies. Consider the use of virtual reality, augmented reality, live streaming, mobile apps, and other technological advancements.

2.6.4 Lessons Learned and Best Practices

1) Success Factors: Identify the factors contributing to the success of each case study. This could include factors such as content quality, user engagement, community involvement, and effective use of digital platforms.

2) Challenges: Highlight the challenges encountered during the implementation of each case study. This could involve technical issues, cultural considerations, or unexpected audience reactions.

3) Innovation: Explore how each case study managed to innovate within the context of cultural engagement. Consider whether they struck a balance between preserving tradition and embracing modernity.

2.6.5 Comparison and Application

1) Cross-Case Analysis: Compare the outcomes and approaches of different case studies. Look for common themes, trends, and successful strategies that could be applied to the development of the novel engagement model for Puju Opera.

2) Adaptation: Consider how the lessons learned from these case studies can be tailored and applied to the unique cultural and artistic aspects of Puju Opera while addressing its preservation challenges.

By following this guideline for case studies, The researcher can systematically analyze and draw insights from existing initiatives that have successfully engaged audiences through digital platforms. These insights can then inform the development of your novel engagement model for the preservation of the Puju Opera in Shan Xi, China.

2.7 Puju Opera is a culture in Shan Xi:

Puju Opera, deeply rooted in the cultural history of Shan Xi, stands as a valuable testament to China's rich heritage. With its intricate blend of music, storytelling, and theatrical performance, Puju Opera has enchanted audiences for generations. However, the challenges of diminishing audiences and the need for intergenerational transmission of skills threaten its continued existence. The integration of Puju Opera into digital platforms holds the potential to address these challenges and secure its legacy:(Liang Zhigang. 2018)

2.7.1 Recognizing Cultural Significance

The guideline begins by recognizing Puju Opera as a vital cultural asset of Shan Xi, deeply embedded in its historical narrative and artistic heritage. It highlights the opera's role in transmitting local stories, values, and artistic expressions across generations. By acknowledging Puju Opera's cultural significance, the guideline underscores the need for its preservation as an integral part of Shan Xi's identity.(Liang Zhigang. 2018)

2.7.2 Integration of Digital Platforms

Embracing the digital age, the guideline emphasizes the integration of digital platforms as a means to preserve and promote Puju Opera. It acknowledges the transformative potential of technology in reaching wider audiences, especially the younger generation. The guideline encourages the creation of multimedia content, interactive experiences, and online platforms to engage audiences beyond geographical boundaries.

2.7.3 Balancing Tradition and Innovation

Central to the guideline is the principle of maintaining a delicate balance between tradition and innovation. It recognizes the importance of preserving Puju Opera's core elements, including its stories, music, acting techniques, and instruments. At the same time, it encourages innovative approaches that enhance the opera's appeal to contemporary audiences. The guideline seeks to promote creative adaptations while respecting the essence of Puju Opera. (Liu Ting, 2014).

2.7.4 Intergenerational Knowledge Transfer

One of the cornerstones of the guideline is the facilitation of intergenerational knowledge transfer. It underscores the responsibility of experienced Puju Opera practitioners to impart their skills, techniques, and wisdom to younger generations. To achieve this, the guideline recommends the development of digital resources, online workshops, and mentorship programs that bridge the gap between seasoned performers and emerging artists.

2.7.5 Community Engagement and Collaboration

Fostering a sense of community engagement and collaboration is another key aspect of the guideline. It encourages the establishment of online communities where enthusiasts, practitioners, researchers, and learners can connect, share insights, and collaborate on projects related to Puju Opera. This collaborative environment not only strengthens the opera's preservation efforts but also promotes a sense of shared ownership. (Liu Ting, 2014).

2.7.6 Cultural Respect and Authenticity

The guideline stresses the importance of upholding cultural respect and authenticity in all digital engagement initiatives. It calls for a nuanced approach that preserves Puju Opera's cultural integrity while embracing digital innovation. This

involves ensuring that the content and presentations accurately represent the historical and artistic essence of Puju Opera, fostering a deep sense of cultural authenticity.

2.7.7 Long-Term Sustainability

Lastly, the guideline emphasizes the necessity of long-term sustainability in all preservation endeavors. It encourages the development of self-sustaining digital platforms, funding mechanisms, and partnerships that ensure the continued promotion and preservation of Puju Opera beyond the immediate scope of the project.

In essence, the guideline serves as a comprehensive framework that recognizes Puju Opera's cultural importance, outlines strategies for its preservation, and underscores the role of digital platforms in safeguarding its legacy for generations to come.

2.8 The Need for a Novel Engagement Model:

While existing research offers insights into utilizing digital platforms for cultural preservation, the unique nature of Puju Opera necessitates a tailored approach. Existing literature often lacks comprehensive guidance on how to create engaging and sustainable digital models specifically for traditional performing arts like Puju Opera. This research seeks to contribute by proposing and evaluating a novel engagement model that not only promotes Puju Opera but also ensures its survival through effective integration with digital platforms.

2.8.1 Evolving Audience Preferences:

Contemporary audiences, particularly the younger generation, are increasingly drawn to digital content and interactive experiences. Traditional art forms like Puju Opera risk losing their appeal among this demographic due to a perceived lack of interactivity and relevance. The need for a novel engagement model arises from the requirement to align Puju Opera with evolving audience preferences and to create an experience that captivates, educates, and resonates with modern sensibilities.

2.8.2 Dwindling Audience Base:

Puju Opera has historically been enjoyed by an older generation with a deep appreciation for cultural traditions. However, this demographic is gradually decreasing, and there exists a substantial gap in attracting younger audiences. The novel engagement model seeks to bridge this gap by employing digital platforms to

introduce Puju Opera to a wider range of individuals, thereby rejuvenating its audience base and ensuring its continued appreciation.

2.8.3 Intergenerational Knowledge Transfer:

The transmission of Puju Opera's intricate skills, stories, and techniques from experienced practitioners to the younger generation is crucial for its survival. The lack of interest among younger individuals to commit to traditional training methods poses a challenge. The novel engagement model addresses this challenge by utilizing digital platforms to create accessible and engaging avenues for intergenerational knowledge transfer, ensuring the preservation of Puju Opera's artistic essence.

2.8.4 Geographical Limitations:

The confinement of Puju Opera performances to specific locations within Shan Xi restricts its exposure to a broader audience. The novel engagement model recognizes the need to overcome geographical limitations by leveraging digital platforms to deliver Puju Opera's performances, stories, and cultural significance to audiences beyond Shan Xi's borders. This expansion not only enhances the visibility of Puju Opera but also contributes to its preservation on a wider scale.

2.8.5 Cultural Relevance and Innovation:

While Puju Opera's traditional elements are cherished, the novel engagement model aims to infuse innovative features that appeal to modern audiences without compromising its cultural authenticity. By adapting Puju Opera to digital platforms, the model seeks to demonstrate the relevance of this art form in contemporary discussions and collaborations, thereby fostering its sustained significance.

2.8.6 Sustainability and Continuity:

The existing challenges necessitate a solution that is sustainable in the long term. The novel engagement model envisions a self-sustaining ecosystem where the integration of Puju Opera with digital platforms not only attracts initial interest but also cultivates ongoing engagement and support, ensuring the perpetuation of Puju Opera's cultural heritage.

In summary, the guideline for the need of a novel engagement model underscores the urgency to address the challenges Puju Opera faces in the modern context. By aligning with evolving audience preferences, facilitating intergenerational knowledge transfer, overcoming geographical limitations, and emphasizing cultural

relevance, the proposed engagement model aims to bridge the gap between tradition and innovation, thereby ensuring the preservation and continuation of Puju Opera for generations to come.

This detailed guideline elaborates on the reasons behind the need for a novel engagement model and provides a comprehensive understanding of the challenges and opportunities that the model seeks to address in the context of preserving Puju Opera in Shan Xi, China.(Wang Wen,2018).

Remember that the literature review should provide a balanced overview of relevant studies, identifying trends, gaps, and controversies in the existing literature. It should culminate in a clear rationale for your research and highlight the significance of your proposed novel engagement model for the preservation of Puju Opera.(Wang Wen,2018).

2.9 Puju Opera in Shan Xi Province

For the spread of Puju opera in Shan Xi, the first collection of all kinds of data and research results related to the performance art of Puzhou Clapper. Research on the performing arts of Puzhou Clapper (Jiang Yaping ,2021).



Figure 2. 1 Villagers watch a performance on the village opera stage

2.9.1 Performance class

According to the current data and literature collection, there is no comprehensive study of performance monographs, fragmented records are mostly reflected in the two journals of Pu Opera Art and Opera Friends, and there is no systematic research. (Jiang Yaping ,2021).

In recent years, many master's degree theses are researches on the individual performing arts of Pu opera artists, such as "Wang Xiulan and her Performing Arts Research" (Fan Chuqiao,2014)."Ren gen Xin and her Performing Arts Brief " (Feng Zhiying, 2008.) , "Wu Junying Research" (Liu Ting, 2014)."Analysis of Jing Xuebian's performing arts" (Li Lifen, 2013). " Research on Zhang Qingkui and His Performing Arts" (Yan Juanjuan, 2012)In addition, there is also a performance of a certain profession in Pu OperaDiscussions, such as "A Brief Discussion on the Performing Arts of Pu Opera Dancing Role" (Zhang Guangai , 2001)."On the Performing Art of Pu Opera" (Ren Chongyuan , 1994). All are talking about the author's views on the performing art of Pu opera. These articles are all based on a certain actor or a certain line as the research object, and there is no comprehensive research on the performing art of Puzhou Clapper Opera. (Jiang Yaping, 2021)

Puzhou Clapper performance of Wang Gengji edited "Pu Opera art classic Record" of Pu opera Sanyi corner performance of upstairs, downstairs, over the single-log bridge, crossing the river, opening the door, pushing the curtain out, rolling the curtain, the curtain, the inside door, the inside door, the outside door, the outside door, worshipping, boarding, disboarding, buttoning shoes, eating noodles, undressing, folding clothes, picking mulberry, twisting thread, playing mahjong twenty-one kinds of procedures The movement is described in the teaching formula, and the stage art is recorded in the classic plays of Puzhou Clappers, "Shaohua Mountain" performed by Wang Xiulan and "Watching the Parade" performed by Zhang Qingkui (excerpts are made in this book). "Coal Mountain · Sword", "Zangzhou · Boat", "Killing Fu · Horse", "Lingu Bed · Qingshou", "Yuanmen Shooting Halobes · Liuhe frame", "Painting Mei · Trial Huang", "Zidu · Hui Ying falling Horse", "Zhao Orphan · Chaofang", "Gao Pingguan · Pian Horse" and "Chao Jin Ding" (fragments) made a record of stage performance, which is a relatively concentrated book of Puzhou Clapstick performance materials. The book of Puzhou Clapper thirty-one kinds of

stunt performance skills also made a specific description. In short, this book provides rich materials for the study of the performing arts of Puzhou Clapper Opera. (Jiang Yaping ,2021)

2.9.2 Music

The seven major styles of Pujou musical tradition are "two characters", "adagio", "pull-back", "flowing water", "interplate" and "rolling white", which exist in a complete derivative system. (Jiang Yaping, 2021).

Among all kinds of local operas, the music of local operas is the one that can best express the characteristics of Pu opera. Pu Opera has not left more monographs and literati records in the aspect of music, and the limited records have gradually developed after the founding of the People's Republic of China.

"Shan Xi Clapper Music" (Chang Sumin,1952)."Pu Opera Music" (Duan Lianhai ,1955). "Pu Opera singing structure" (Zhang Feng & Kang Xisheng,1964). "Pu Opera modern opera singing style", (Zhang feng,1979). "On the Clapper Opera" (Chang Jingzhi,1991)."Pu Opera singing structure", Pu Opera Excellent singing style selection" (Du Yunjia & Chang Yuanfa 1998). Some of these works have made a detailed review of the traditional singing style of Puzhou Clapper Opera, and some have made a review of the reform and development of modern opera on the basis of traditional singing style. We also made a detailed arrangement of the Puzhou Clapper Opera style (Suona Qui & Silk Qui) .and percussion music, which is the primary data for the study of the music and singing of Puzhou Clapper Opera. According to the drama data, for some reasons, some monographs have not been officially published, which cannot be a restriction on the communication of Puzhou Clapper Opera. "On Clapper Opera" compares Clapper Opera with other operas from two aspects of comparative study and historical study, discusses the musical structure and form of Clapper opera, the law of spread and evolution, and makes a comparative study of various Clapper opera music. (Jiang Yaping, 2021).

2.9.3 Plays and plays

The early plays of Pu Opera were mainly based on storytelling stories and folklore; Second, the adaptation and transplanted of other plays, especially the Yuan drama, such as "Dou E Quan", "The Story of the Western Chamber", "The Orphan of Zhao" and "Single Knife Club". Pu Opera also adapted and transplanted the

later plays of Southern Opera, Kunqu Opera and Geyang Opera. In the drama circle of Qing Dynasty, the script of Puzhou Clapper Opera is the model, and the repertoire of Pu opera is very rich.(Jiang Yaping, 2021).

Before the founding of the People's Republic of China, artists had a saying of "three thousand in Tang Dynasty, eight hundred in Song Dynasty, and countless three rows and states" (Puzhou Bangzi,2007). Although these rumors may be exaggerated, they can also show the large number of them. According to "Buan Tan Opera Collection", Guo Baochen, the famous actress of Pu Opera, "can play more than 300 books". (Edited by Xueyuan Publishing House,2013). In 1963, the statistics of the reference room of Jinnan Pu Theatre were 1364, which was enough to see the richness of Pu's repertoire. As a local opera, there is not much information about the repertoire, which was basically passed on by mouth in the past. After the founding of the People's Republic of China, the data arrangement of local operas gradually attracted the attention of the academic circle, and the data arrangement was gradually standardized. (Jiang Yaping, 2021).

"Chinese Local Opera Collection · Shan Xi Volume"(Chinese Local Opera Editorial Committee (1959) . "Shan Xi Local Opera Compilation" (Drama Work Research Office of Shanxi Provincial Department of Culture (1981) ."Puzhou Clapper Traditional Script Compilation"(Compilation of Puzhou Bangzi Traditional Scripts,1992). "Pu Opera Traditional Folding drama Anthology" (Kang Xisheng, Zhang QiuJun, Yang Huanyu, Fan Yuexia,2016) ."Pu Opera Traditional Script Anthology"(Yang jin gui ,2016). These books are simple script collection, Among them are the manuscripts of the 1950s, the mimeographs staged by various Pu opera troupes after the founding of New China, the manuscripts and a few newly discovered folk or foreign collections, as well as the basic traditional Puzhou Clapper Opera plays. On the one hand, it is conducive to the preservation of the ancient Puzhou Clapper art heritage, and on the other hand, it also provides detailed information for the opera workers to sort out and adapt traditional plays and drama research. The Dictionary of Puzhou Clapper Opera Repertoire contains more than 1400 plays in total. This book provides rich materials for exploring, collating and studying the plays of Puzhou Clapper Opera, and has important reference value for discussing the evolution and development of Puzhou Opera.(Du Bo, Xing Lexian, Li Enze,1989).

Pu drama is good at innovative use of stunt performance, performance of character and mood, even if the scene, the plot, but also carved, play skills, will be interpreted into a classic. Such as Wang Cuncai's "Hanging Pictures", Yan Fengchun's "Running City", Wang Xiulan's "Baking fire" and "Eating noodles", Jing Xuexian's "Wu Dan" and "Driving", etc. Pu opera historian and playwright Mo Yiping, a native of Hejin, Yuncheng, Shan Xi Province, founded Yan 'an People's Theater in 1939, and created more than 20 Pu operas such as "Zhengqi Map", "Stone Man Tears", "Flying Huling" and "Dragon Gate". Her main activities were in Yan 'an and surrounding areas, and she often performed in Yan 'an Yangjialing Central Auditorium and Wangjiaping Military Auditorium. Among them, more than 10 Pu opera scripts such as "Zhengqi Map" were compiled into the "North China People's Drama Series" at the beginning of liberation and published in Shanghai. Mo Yiping made special contributions to the collation, compilation and protection of Pu opera cultural historical materials. He has written and published such monographs as the Soul of Pu Opera History, Exploration of the Source, Initial Exploration of Hui Opera into Jin Dynasty, and the Ancient Pingshui in the Romance, leaving precious Pu opera cultural materials. (Li Qi,2018).

2.9.4 Pu Opera dissemination

In recent years, many master and doctor dissertations are about the propagation of Puju in Shan Xi Province. for example:

The research of Puzhou opera of Shan Xi Province under the Protection of ICH (Wang Qian,2014).Study on the application of new media Technology in the digital protection and dissemination of traditional drama ---Take the Zhejiang Wuju opera as example》(Zheng Jiqin,2016). 《Research on the innovation of local opera culture communication mode in the new media era -- A case study of Pu Opera in Shan Xi Province》(Jia Yaqi,2021).

《Research on Local Drama Marketing Strategy under New Media SituationTake Yu Opera as an example》(Chen Guangyu,2018). 《A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Fine Arts 》(Wu Yudan,2022)

2.9.5 The genre of Pu opera

Pu Opera in the development process, there have been two different schools of art. One is the "South Road drama" centered on Pingyang Puzhou, the other is the "West road drama" centered on Pingyang. West road drama to play the traditional upper, middle and lower 24 books, re-do the gong singing, more passionate feelings. "South Road Drama" focuses on legendary stories and plays more elegant plays based on love. In the past hundred years, Pu opera art has emerged several generations of famous actors, such as Yang Laolu, Sun Guangsheng, Wang Cuncai, Jing Liugen, Yan Fengchun, Yang Hushan, Xiao Yuelai, Zhang Qingkui, Wang Xiulan and so on. The famous actors in Pu Opera in the new period are Ren Hexin, Guo Zhenmin, Wu Junying, Jing Xuecheng, etc. They inherited many traditional operas, but also rehearsed new plays that fit in with The Times and promoted positive energy.(Wang Qian,2014).



Figure 2. 2 The audience is watching the performance announcement



Figure 2. 3 The audience watched Pu's opera in the theatre



Figure 2. 4 Performance of "Pu Opera"

The West Road opera and the South Road opera have formed their own characteristics in the long-term development process, and people generally call it "the South Road is elegant, the west road is hot". The biggest feature of the West Road drama is "vulgar", which is more popular than the South Road drama. The origin of the drama of the West Road is relatively complex, compared with the drama of the South Road, it pays less attention to the integrity of the story and the twists of the plot. (Wang Qian,2014).

The script is more about the characterization of characters, and pays more attention to the real kung fu performance of the "handle style", so the main stunt performance of "Pu Opera" generally refers to the performance of the West Road drama, such as Lu Bu's feathers stunt in the drama "Small Dinner", which is very prominent in the characterization of characters and the expression of characters' feelings. (Wang Qian,2014).



Figure 2. 5 Characterization and Expressing Emotions

In the folding drama "hanging painting" Wang Cuncai's d "qiaogong" was very famous at that time, in the south of Shan Xi folk spread "rather see the hanging painting of the Cuncai, do not sit in the Republic of China", which can be seen Pu drama stunt performance Because of its vulgar and multi-skill performance, the West Road opera is relatively popular, mainly popular in Yongji, Wenxi north of the regions. The South Road drama is mainly influenced by "Kunqu opera", compared with the West Road drama, the opera lyrics are more elegant, there is a strong literary character, pay attention to the performance of the son and the next poem, the script pays attention to the story of the legendary and bizarre, the stunt requirements of the actors are not high, in general, not as popular as the West Road drama. South Road opera is mainly popular in Ruicheng, Fenglingdu and Lingbao, Weinan and other places at the junction of Jinshan-Henan in Yuncheng area. (Wang Qian,2014).

However, the division of the region is not very absolute, more is the place where the west road play also has the South road play, the place where the South road play also has the West road play activities, and there is no strict boundary. Therefore, the study of this paper is the study of "Pu opera" as a whole, there is no distinction between west road opera and South road opera.(Wang Qian,2014).

2.9.6 Pu opera art composition

1) About Pu opera singing

The reason why Pu opera can become a local opera is that it has formed its own unique artistic style in the process of developing from "small drama" to "big drama". In terms of singing, Pu Opera mainly uses clapper opera, but in the process of communicating with other art forms, it also absorbs Kunqu opera, blow opera and various folk tunes. Pu Opera singing tone is high and passionate, the line is high and unrestrained, the cavity is high and sharp, ups and downs, giving people a sense of generosity and unrestrained. (Wang Qian,2014).

Its characteristics of both large and small voice are good at expressing passion and expressing generous and excited emotions, so Puzhou Clapper is known as "impassioned, rough and unrestrained". This kind of singing characteristics of Pu opera is mainly related to the living habits, language and folk song characteristics of local people. Puzhou Clapper Opera originated from the Yellow River basin, and its tone is mainly related to the tone of the Yellow River basin. The high passion of its

singing seems to be "roaring" from the heart, just like the roar of the Yellow River, as the "Qu Lu" said: "The northern Ci is like a horse on the battlefield, galloping freedom." (Wang Jide,1959) Therefore, when those Pu opera famous actors sing, they shout purely with the song of nature. In order to adapt to the local characteristics of Pu Opera singing, artists have to practice their own singing voice, in order to be able to "roar" out of the loud and passionate Yellow River howl. "(Xu mu yun,2001)The mouth is full of loud cries, and the river is roaring back and forth. Sheng Denier net ugly difference, stirring sound smooth " is the true portrayal of Pu opera singing. (Mo Yiping,1981).

Table 2. 3 Pu opera character classification and character characteristic map

Be qualified for		Tone color	Sound zone	Vocal characteristics
sheng	laosheng	Steady and generous	Both bass and middle	loud voice
	xiaosheng	Bright and powerful	high pitch	Big voice and small voice
	Wu sheng	Coarse ore, generous	Medium, low and high	loud voice
dan	xiaodan	Crisp and steady	Both medium and high notes	Big voice and small voice
	laodan	Vigorous, loud	bass	Loud voice
jing		Upright, atmospheric	bass	Loud voice
chou		funny	Both medium and high	Speak moresing less

Singing: Pu opera's vocal range is very wide, and the dancing of the singing voice is also very large, often more than ten degrees or even two octaves of jumping. Actresses usually sing in their real voices. The male and male female characters make extensive use of falsetto, and the singing height is the same as the actual height of the

female voice. Mo Yiping recorded in the History of Pu Opera Soul: "Starting the cavity - in the palace ". Have to "smash" up the clapper "roar" and play, "magnanimous and unrestrained." -- With a wide voice and a high voice. Connect - in the "corner". Have to "beat" the clapper "sing" Wu sound (Tao song), "single straight pure attack and clean." -- In a flat voice and in a single voice. Tail cavity - in the "feather". Get "point" and clapper "choke" bay bay, "sharp crisp and quiet singing".-- Enunciate in a low pitched voice. (Lidou,2014).

Drag cavity - do not spit "word" only drag "sound", according to the "word feeling" the wave and rise, the depression is depressed and fall, the palace horn feather can be spontaneous, always seek melody, listen to melodious. These Pu opera "little play" when the things, to the "big play", respectively in the "singing" also "seedlings" retained. Singing as long as the singing to the "integration", pleasant and pleasant, in the audience is a kind of artistic enjoyment. The so-called "sing to the art, spooky June cold", this is also.(Li dou ,2014).



Figure 2. 6 A colorful face in a TV drama

2) About the role trade

Pu drama in the process of development for many years, the role of the industry has gradually become complete. Today, Pu Opera has formed a variety of roles including Xusheng, Laosheng, Xiaosheng, Zhengdan (Qingyi), Xiaodan, Lao

Dan, Dahua face (Dajing), Erhua face (Jing), and Sanhua face (Chou). And there are several branches in each line. In the course of the development of Pu Opera, these roles show a variety of characters with distinct personalities.(Li dou ,2014).



Figure 2. 7 The role of the flower in the drama



Figure 2. 8 Wu Dan role in Pu Opera

Pu Opera is good at using special effects to show the characters character, mood. And Pu drama according to the character of the mood to create a variety of difficult performance skills. These showmanship skills are popular with the public. There are more than 30 unique skills in Pu Opera performance, Among them, the combination of cockwing gong, gong, quizi gong, Zhuzi gong, whip gong, chair gong, fan gong, paper flags and color Gong enjoys great fame in the national opera circle.(Wang qian,2014).



Figure 2. 9 Pu drama performance pick kung fu



Figure 2. 10 Whip in a play



Figure 2. 11 A prop beard in a play



Figure 2. 12 Pu opera performance fire color

3) About Musical Instruments

The accompaniment instruments of Puzhou Clapper Opera are divided into literary field and martial field. The Musical Instruments in the field are mainly Banhu, supplemented by flute, two-strand string, three-string, erhu and other instruments. The

instruments in the martial arts field are relatively complex, mainly drum, horse gong, female plate, date bang, cymbals, tanggu, small gong, ream, war drum, Dao gong, percussion bell, cloud gong, wooden fish, Jinggong and so on (Wang qian, 2014).

Pu Opera singing mostly expresses unrestrained, warm, generous and other emotions, so the musical instrument configuration in Pu opera also has such characteristics. Its band is divided into two parts: literary and martial arts:

Banhu - a tenor Banhu, also known as "Huhu" is the leading instrument of the Banhu. "6 3" strings, clear and bright tone, wide range. The instrument is long. The instrument is 770 mm long, the rod is 84 mm in diameter, and the bow is 890 mm long.

Two strings - shaped like an erhu, consisting of a cylinder, a shaft, a file and other parts, the material of the file is generally ebony or sandalwood. The length is about 57 cm, the cylinder is round, generally made of sandalwood, mountain elm or paulownia. The bow is short and thick. Two strings with cow tendons, the left hand to wear gloves when playing, the voice is sharp, for the accompaniment of Musical Instruments. Before and after the Anti-Japanese War, this instrument was no longer used by Pu Opera (Liang Zhigang, 2018).

Flute - alto wind instrument. A common six-hole flute. The main musical instrument of Pu Opera. The "two-eye tone" used in Pu opera music in the past is the "gong" tone of the second hole of the flute from the next number. Its height is equivalent to the B-flat on a keyboard instrument.

Three-string -- mezzo-plucked musical instrument. It is a small three strings for ordinary use, accompaniment instruments, sandalwood production of its rod, python skin drum. 160 mm high and 140 mm wide. Oval cylinder, need to wear "nail sleeve" or "plectrum" when playing.

Erhu - alto string instrument. It is commonly seen as the Erhu, with "52" chord. For Pu Opera music field accompaniment instrument.

Suona -- one or two suona, divided into big suona and small suona two kinds. In addition to playing a variety of music, Pu opera also does "mimicry" effects, such as birds, horses, chickens and so on.

Martial arts: The drum is not only the conducting instrument of the martial arts, but also the conductor and leader of the whole band. Master the civil and military priorities.

Clapper - commonly known as wood, made of mahogany or rosewood or jujube wood, etc., consists of a flat round wood stick about 20 centimeters long and a slightly thicker round wood stick about 18 centimeters long. When playing, the left hand holds the flat round wood, the right hand holds the round wood, and the board is knocked.

Letter board - three rectangular boards, the first two tied together with silk, and the last one tied together with a rubber band or silk rope. The wood is generally made of rosewood or boxwood or pear wood. When playing, the left hand hits the word plate and the right hand beats the drum to form a plate.

War drum - mainly used in martial arts to render the atmosphere. The performance of the orchestra in the conductor's office is shaped like a barrel, with a smaller drum and cowskin on both sides.

Big gong - commonly used musical instrument in Pu Opera martial arts, round, the diameter of the outer ring is 60 cm, the width of the side is 2.5 cm, and the thickness is 0.1 cm.

Cymbals - commonly used Musical Instruments. Sometimes used in combination with a horse gong, sometimes solo to match the effect sound.

Small cymbals - used in conjunction with gong, also used in combination, and can be used as percussion instruments in Suona Qupai.

Gong - A musical instrument that can be used solo or in combination with other instruments.

Touch bell - a color instrument. It is mostly used in the percussion of strings, shaped like two small copper bells that are strung together with a string to make a sound.

Tangu - framed with wooden strips and covered with cow skin on both sides. It is generally used for accompaniment and war. The traditional Tang drum looks like a round drum, and now it is mostly shaped like a flower pot.

From the accompaniment instruments of Pu opera, we can also fully see its regional characteristics. The script of Pu Opera is full of martial arts, and the jujube is

the ultimate feature of Pu opera. It has a lot to do with the local environment. Jujube wood is the main material for jujube, and Puzhou area is rich in jujube trees, in the "North dream Suoyan" recorded that "the river (Puzhou) Yongle county jujube, the generation of jujube seedless, eat can also be degree."(Wang Qian, 2014) There are Su's female since childhood to eat, do not eat grain, 50 years, Yan as a virgin." (Wang ji de, 1959)It can be seen that jujube trees in Puzhou were paid attention to by people in Song Dynasty. Among other instruments, gongs, drums, cymbals and so on are the main instruments of gong and drum drama, and gong and drum drama is an important form of artistic performance in Hedong area. The Musical Instruments of Pu opera and gongs and drums can reflect the communication between different art forms, and also reflect the local characteristics of Pu opera. From the point of view of the Musical Instruments of Pu opera, Pu opera has the characteristics of material cultural heritage while being an intangible cultural heritage. The accompaniment instrument of Puju Opera has become an important part of the intangible cultural heritage of Puju Opera in material form.(Wang Qian, 2014)

4) About clothing

From the Ming and Qing dynasties to the founding of New China, Pu opera lasted hundreds of years, weathered the wind and rain, still stubbornly standing on the Chinese opera stage, and in 2006 became China's first batch of intangible cultural heritage Pu opera after hundreds of years of evolution, in the continuous development of maturity, independence at the same time, also developed its own characteristics (Peng Bingyu, 2019).

Namely: the program (drama dress norms);

Dancability (theatrical costumes contribute to the characteristics of opera dance);

Symbolic (opera dress has its specific meaning, the role meaning represented);

Decorative (that is, opera clothing has the role of beautifying the role and beautifying the stage). (Peng Bingyu,2019)

It can be seen that the research of this subject can achieve the purpose of better understanding the development and change of traditional drama and its costumes, understanding Chinese culture and exploring Chinese history. Pu Opera's

clothing is varied and varied, generally extending the clothing styles of the Ming Dynasty, and on this basis, it has developed to the present day is very gorgeous. Similarly, due to the demand of opera culture, Pu Opera's traditional costumes are also very stylized for its dress, dancing, and stage art. After the baptism of the long history, especially reflected in the dress performance of civil and military officials, and non-official people, Puju dress has different characteristics in each period, which is closely related to economic development, the political consciousness of the ruling class, the cultural ideology of the people, aesthetic cognition and totem worship. (Peng Bingyu, 2019)

The change of Pu opera "clothing" is a certain stylized, in general, mainly based on the clothing of the Ming Dynasty as its basic system, on this basis. As for the specific stage changes of Pu Opera costumes and the causes of folk culture behind them, the author will do a detailed discussion in the fourth chapter. Here to introduce the classification of Pu drama clothing management: Pu drama clothing is called "clothes box" in the class, which is divided into "big clothes box", "two clothes box", "three clothes box", "helmet box" and "flag box" five kinds, and are in charge of different personnel. "Big box" management actors wear "costume" is also called "coat". For example, official clothes, folds, etc.; The "two clothes box" manages the actors' "military clothes", such as arrows; The "three-coat box" manages the actors' underwear, boots and pants. The "helmet box" manages the actors' hats, including male and female helmets. Such as handsome helmet, Fengguan. About "ornaments", mainly refers to the headwear. Pu drama will be the female corner of the headdress habitually called "head".

Water yarn and net: Pu opera each line, male, female, at the beginning of makeup, must be on the head with black silk woven water yarn. The net is made of a ponytail and has holes to help the actors hang their eyebrows (Lidou, 2014).

Baotou: It is the traditional hair style of Pu Opera. Wear a net on your head and put it on your temples. When playing a young girl, she combs her hair on top of her head, doing a "chignon" hairstyle..(Lidou, 2014).

Tiaozi: Also called "baby hair". Generally used for male corner, made of hair, during the performance, a strand of long hair on the top of the head, the actor in the performance of excitement, anger when continuously swinging.

King's hat: the hat worn by the emperor. With a gold base, a golden dragon is cast..(Lidou,2014).

Small Sheng towel: divided into "Wensheng towel" and "Wusheng towel" two kinds. As the name suggests, Wensheng towel is used by the actor who plays Wensheng, the hat top to the two ears have a hard pattern, show colorful patterns, and there are two streamers behind it for playing scholars and scholars. "Wusheng Towel" has the same pattern as Wensheng towel except that there is no ribbon at the back and the top is tied with red silk knot. In addition to these commonly used "decorations", there are "Emperor's son-in-law's hat", "eight diagrams", "handsome helmet", "Phoenix crown", "member's towel" and so on. A wide variety, used for different plots, characters needs to enhance the stage performance effect..(Lidou,2014).

5) About the performance

Trade and practice Pu Opera has developed nearly 400 years of history, and its performance roles have been divided into four major trades: Sheng, Dan, pure and ugly. However, it is traditionally known as the three major professions of Pu opera - Sheng, Dan and Hua Face. Of course, as an ancient opera art, the role of Pu opera has its own complicated history. For example, in the middle of the Qing Dynasty, Shengxing includes Zhengsheng, Xiaosheng, Shengsheng, Laosheng, Waiwei and Wei; There are Zhengdan, small Dan, ugly Dan, flower Dan, stick Dan, old Dan. In addition, there are soldiers, soldiers, school guards, and so on. It can be seen that the division of Pu opera role industry is more complex and detailed. To this day, it can be said that the division of roles in Pu opera art is the same as that of Beijing Opera, which is called "four beams" and "four pillars" in Pu opera jargon. "Four beams" namely: Dajing (Dahua face), two Jing (Erhua face), small Jing (Sanhua face), Wudan. "Four pillars" namely: Xu Sheng, Xiao Sheng, Tsing Yi (Zhengdan), Xiao Dan. Among them, the role and status of Siniang is much more important than that of other industries, and there is a saying that "once you pick the octagon". In Pu opera, even ordinary opera troupe will stipulate that the "four beams" and "four pillars" can not be "single" but must have several sets of people, such as a large net, two net, small net and some other pieces of performance. The practice of each line of Pu opera can be divided into: Xiao Dan Gong: Xiao Dan, play more decent and innocent young women , to sing. Many require "superior" eyes to show

character. Therefore, for the female character who plays a small Dan, the most important thing is "eye work". To practice eye exercises, you need to burn incense at night, keep your eyes on the incense head, and practice in the right direction up and down; Express emotions in front of the mirror to train the sensitivity of facial muscles. In addition, Xiao Dan also need to practice the basic footwork "flower Clapper", that is, the strength of the calf to walk, avoid raising the chest and putting the feet flat. When walking, the legs should not be together and not touch, the front foot should fall first, the back foot should be flat, the body should be flat, and the hand should swing back and forth, the rhythm should be corresponding to the waist and leg joints. Dan's gestures dictate that you raise your hand at breast level.(Wang Qian, 2014).

Xiao Sheng Gong: Xiao Sheng mainly plays a young man, on the stage performance, requires a dignified and elegant manner. Therefore, for young actors, physical strength and leg work are very important. Especially the leg work, there was such a saying among the old artists at that time, "Three years can practice a good heel, but it is not good to practice a pair of legs." (Liang Lexian, Li Enze, 1993). In order to practice good leg work, Xiao Sheng should often rub the calf and rub the hamstring. The old artists use the method of "sitting on the flying bench" to train the leg work, requiring the leg to kick up, the sole of the boot to be able to wrap the crotch mouth, and the foot to hook. It is said that such training methods are borrowed from a trick in national art.(Li dou, 2014).

In addition to the above two exercises specified for special roles, Pu opera art has some basic skills that must be practiced in each line of work. Body work: Pu Opera's body work usually uses two kinds of horseback riding and semi-horseback riding. Its basic training has left and right arm, golden rooster independence, left and right cloud hand and so on. During training, the chest should be lifted without shrugging shoulders and the stomach should be pulled in without bending. Hold the hand empty fist, shake to curl. Upper body straight, lower body soft, flexible. Handzi Gong: Handzi Gong roughly includes knives, guns, swords, sticks, fists. The size of the handle varies, according to the individual body of the actor, some eyebrow, some chin. Some reach the tip of the nose. Stage work: also known as "circle work" is applicable to various trades. The basic requirements are to raise the belly, walk to

contain the chest, the back, the body should be flat, the posture should be beautiful, the footsteps in the hook outside the swing, running fast and beautiful. When training to be angry Dantian little leg with thigh, two feet rolling forward. In addition, there are blanket work, flip work, jump work, etc., here do not describe one by one. Only by earnestly practicing these basic skills day after day can the actors of Pu Opera ensure that the distinctive character characteristics are presented on the stage (Li dou,2014).

6) stage art

For a long time, the sets and installations of traditional Chinese operas are relatively fixed sets. For a long time after the formation of Pu opera, it is usually used to beautify the stage with the performance of tents, banners, a table and two chairs, table skirts, chair drapes, curtains, etc. From 1940 to the beginning of the founding of the People's Republic of China, some famous actors began to have colorful embroidered door curtains and curtains embroidered with their names. During the War of Resistance Against Japan and the War of Liberation, some theater companies began to use three-wall scenes and hard scenes such as Windows, trees and cities. After the founding of the People's Republic of China, with the widespread use of electric lights, the technology of "electric cloth playing the scene" appeared on the stage, which was welcomed by fans; In 1951, the Ministry of Culture proposed to "purify the stage", and the "organ scenery" disappeared. From the late 1950s to the eve of the "Cultural Revolution", Pu Opera Company absorbed a lot of professional stage workers, and then designed many exquisite embroidery screens, screens, and flexible sceneries, props, scenery and other stage appliances. After 1976, due to the changes in the audience structure, the development of science and technology, and the changes in aesthetics, the stage art and stage installation of Pu Opera constantly introduced advanced technology, showing a large number of excellent stage design, such as "Fireworks Tears", "Hang Pictures", "Orphan Story", etc., most of which won provincial and national stage design awards. It gives full play to the role of the beauty of dance in the comprehensive art of opera, and achieves very good artistic effect (Li dou,2014).

2.10 Theory about satisfaction

2.10.1 The meaning of satisfaction

Satisfaction is a psychological state, which refers to an individual's subjective evaluation of a certain thing or relationship, a product/commodity or service with shape or without shape. It is the feeling of pleasure after the individual's needs are met, and the relative relationship between the individual's experience of the product or service and the actual feeling after the actual use of the product or service. If this psychological state is measured by numbers, it is called satisfaction, and satisfaction is the basic condition of loyalty.

2.10.2 Concept of satisfaction

First of all, conceptually, customer satisfaction refers to the degree of difference between the customer's psychological expectation of the product or service and the actual feeling after the actual use of the product or service. If you put a number to measure the degree of psychological difference, this number is called satisfaction.

In the evaluation of satisfaction through survey questionnaires, satisfaction is an index concept obtained by weighted calculation of evaluation scores, which is a value between 0 and 100. Each customer has a separate satisfaction value, and the average of all customer satisfaction is the overall customer satisfaction.

2.10.3 Criteria for evaluating satisfaction

Satisfaction of each customer = $(\text{score} - 1) / (\text{score} - 1) * 100$

Overall customer satisfaction = $\text{Satisfaction (Customer 1)} + \text{satisfaction (Customer 2)} + \text{satisfaction (Customer n)} / n$

Satisfaction rate is also a method used to evaluate customer satisfaction, which refers to the proportion of satisfied customers in a certain number of target customers, which is the percentage between 0 and 100. The satisfaction rate represents the percentage of the total customer satisfaction of the target, and there is no single customer satisfaction rate concept.

Overall satisfaction rate = $\text{Number of satisfied customers} / \text{total number of target customers} * 100\%$

At present, the commonly used satisfaction scoring system has five points and ten points, and the satisfaction calculation formula is consistent:

The formula for calculating satisfaction on the five-point scale is: $(\text{score} - 1)/(5-1) * 100$

The formula for calculating satisfaction on the ten-point scale is: $(\text{score} - 1)/(10-1) * 100$

2.11 Research Related

Mazumdar B.T. (2021) conducted a study on Digital Diplomacy: Public Diplomacy Activities on the Internet or a New Form of Public Engagement? This text discusses digital public diplomacy, which can be seen as an extension of traditional public diplomacy through online platforms. The study analyzes Facebook posts and tweets from six actors, revealing that while most digital diplomacy aligns with existing classifications, some activities do not fit neatly into established categories. The study introduces four novel activities: engagement-promotion, routine lifestyle diplomacy, personal reaction/reflection diplomacy, and Internet meme diplomacy, collectively termed social digital media diplomacy. It also highlights distinctions among digital diplomacy actors based on their approach to participatory digital culture and emphasis on cultural diplomacy and public engagement. The implications for communication and international relations are explored.

Liang X, Lu Y, Martin J. A. (2021) Reviewing the role of social media in the sustainability of cultural heritage, the study highlights the increasing importance of the use of digital tools, especially social media To engage local communities in preserving and promoting cultural heritage. Digital technology offers benefits such as improved conservation. A more complete document library Participation experience and improved communication The systematic review analyzed 39 cases from 19 articles, most of which were concentrated in Europe. This indicates the need for a global effort to preserve heritage using digital technologies. Although social media is widely used in museums, But its application to heritage and urban landscapes is limited. Facebook is the most popular platform, with an average score for the interactive approach to inheritance management. This study emphasizes a people-centred approach. It encourages equality in cultural diversity, although UNESCO emphasizes community cohesion. But global social media use tends to focus more on spreading heritage values than promoting collaboration. Some countries, such as

China, encourage local approaches. by supporting local participation in decision making.

In summary, this study provides a comprehensive understanding of current research. It presents practical cases and outlines the guidelines, objectives, and importance of using social media for heritage conservation. More research is needed to explore the optimal use of social media platforms across diverse cultural backgrounds. This is especially true when considering the challenges posed by rapid urbanization.

Liu, J., Ning, L. and Gao, Q. (2023) This study investigates the knowledge transfer mechanism of digital platforms within the digital innovation ecosystem. In the digital economy era, digital platforms are crucial for innovation, and understanding efficient knowledge transfer is essential for acquiring digital value and gaining a competitive advantage. The research utilizes the susceptible-infected-removed (SIR) model and communication dynamics theories to explore the symbiotic interaction rate among users. The findings reveal that the evolutionary path of the symbiotic model plays a key role in knowledge transfer, with reciprocal symbiosis being the most effective. The study emphasizes the positive impact of the symbiotic rate on knowledge transfer dynamics, particularly in the reciprocal symbiosis model.

Pang and Loo (2024) conducted a qualitative ethnomusicological study at Yuncheng University to investigate how media integration supports the institutionalization of Puzhou Opera. Through ethnographic fieldwork—including observations of performances and interviews with faculty members, students, and local artists—the researchers applied thematic analysis to examine how various media technologies were embedded in the curriculum. Their findings indicate that the use of film, television, and multimedia tools in teaching has contributed significantly to the formal preservation and transmission of Puzhou Opera within an academic context. Moreover, the incorporation of interdisciplinary subjects such as Western music theory and digital media applications has expanded students' capacity to engage with and promote traditional opera in innovative ways, bridging cultural heritage with contemporary communication platforms.

Pang, Loo, and Wei (2024) conducted a case study using qualitative analysis to explore how virtual media applications contribute to the institutionalization of

Puzhou Opera at Yuncheng University. The research involved faculty and students who actively engaged in developing and applying digital media to support the transmission of this traditional art form. Through content analysis of both the media projects and interview data, the study found that integrating virtual tools—such as digital simulations and multimedia performances—not only supports the preservation of Puzhou Opera but also enhances its accessibility to wider audiences. The findings highlight that these media-driven approaches foster sustainable development by enabling the adaptation of cultural heritage within contemporary educational and technological contexts.

Li (2024) conducted a qualitative ethnographic study to examine the role of Meihu Opera troupes in preserving intangible cultural heritage in rural Jin Nan, Shanxi Province. The research was based on 25 in-depth interviews with troupe leaders, performers, cultural officials, and community members, complemented by participant observations. Through thematic analysis, the study revealed that Meihu Opera troupes serve as vital agents in sustaining traditional performance practices, particularly in the face of ongoing socio-economic change. Despite limited resources and institutional support, these troupes continue to adapt by engaging with local communities, maintaining intergenerational transmission, and incorporating culturally resonant narratives that reinforce collective identity and cultural continuity.

Chang and Seekhunlio (2024) conducted a qualitative study to investigate how knowledge of Gannan Tea Picking Opera has been preserved and transmitted following the Cultural Revolution of 1949. Drawing on interviews and observations involving seven key informants comprising artists and community members actively engaged with the opera tradition the researchers applied thematic analysis to uncover patterns in the preservation process. The findings underscore the resilience of this regional art form, which has survived political and social upheaval due to sustained efforts by local communities and support from cultural institutions. Despite historical disruptions, the continued practice and teaching of Gannan Tea Picking Opera reflect a collective commitment to safeguarding cultural heritage across generations.

Han (2024) conducted a qualitative case study examining digital protection strategies for ancient village buildings in Shanxi Province, focusing on the practical application of preservation technologies in real-world contexts. Although no specific

sample group was detailed, the study analyzed various digital preservation methods through content analysis of documented strategies and their implementation. The findings emphasize that the use of digital tools—such as 3D scanning, virtual modeling, and archival databases—plays a critical role in protecting architectural heritage threatened by time, development, and environmental degradation. The study concludes that integrating digital technologies not only supports the documentation and conservation of cultural assets but also facilitates broader public access and awareness, thereby reinforcing long-term cultural sustainability.

Koukopoulos, Z., & Koukopoulos, D. (2016) conducted design and implementation research to develop a participatory digital platform intended for cultural heritage engagement within smart city environments. While no specific participant group was identified, the study focused on the technical and functional aspects of the prototype, using system architecture evaluation and user scenario testing to assess its effectiveness. The proposed platform incorporates role-based access control to enable differentiated levels of participation, ensuring that users—ranging from cultural institutions to individuals—can contribute, curate, and access content in ways appropriate to their roles. The findings demonstrate that such a system not only supports the decentralized dissemination of cultural knowledge but also strengthens preservation efforts by actively involving diverse stakeholders in the management and promotion of heritage assets.

The Shanxi Provincial Government (2025) released a descriptive report outlining its recent initiatives in advancing cultural heritage preservation through innovative strategies. Although the report does not rely on a formal sample group or empirical methodology, it presents policy directions and programmatic actions that emphasize community participation and the integration of emerging technologies. The province highlights the importance of fostering inclusive cultural engagement by encouraging local communities to actively contribute to heritage projects, while simultaneously investing in digital tools and platforms to modernize conservation efforts. The report underscores Shanxi's commitment to balancing tradition with innovation, positioning itself as a national leader in safeguarding intangible and tangible cultural assets through participatory and technologically driven approaches.

Dima, M., Dima, D., & Epure, M. (2024) in their 2024 study, Dima, Dima, and Epure explore the role of immersive technologies in enhancing cultural education through mixed reality performances. Drawing from a multidisciplinary framework, the authors examine how the convergence of virtual and physical environments allows users to engage more deeply with heritage narratives. Their study emphasizes the potential of mixed reality (MR) to transform passive viewers into active participants by offering embodied experiences of cultural content. Through case studies and analysis of MR-based heritage exhibitions, the authors highlight how such technologies can support inclusive education, strengthen cultural memory, and broaden access to intangible heritage. The findings affirm that MR is not merely a tool for visualization but a meaningful medium for interaction, interpretation, and co-creation within cultural learning environments.

Zhao et al. (2025) conducted a mini-review titled “Virtual Reality in Heritage Education for Enhanced Learning Experience: A Mini-Review and Design Considerations.” The study explores how virtual reality (VR) can enhance heritage education by fostering engagement, cultural understanding, and historical awareness. The authors emphasize that VR technology offers immersive and interactive experiences—such as 3D historical reconstructions and gamified learning—which help bridge the gap between traditional cultural narratives and contemporary learners. This review synthesizes transdisciplinary research to assess the current state of VR applications in heritage education, highlights existing limitations, and proposes design considerations for future development. The findings aim to inform educators, designers, and developers about how to integrate VR effectively into cultural heritage programs, ultimately improving pedagogical practices and supporting the preservation and transmission of collective memory.

Buragohain et al. (2024) conducted a study titled “Digitalizing Cultural Heritage Through Metaverse Applications: Challenges, Opportunities, and Strategies” to investigate the role of metaverse technologies in preserving and promoting cultural heritage. Using a systematic literature review guided by PRISMA and supplemented with case study analysis, the researchers explored current practices, technological innovations, and strategic frameworks in the digitalization of both tangible and intangible cultural assets. The study addresses key concerns such as authenticity,

sustainability, and inclusive representation, emphasizing the transformative potential of immersive virtual environments in enhancing public engagement and cultural education. The findings contribute practical strategies and highlight the growing importance of metaverse applications in shaping the future of heritage preservation in a globalized and digitized world.

Liew and Passau (2024) in their article “Digital Platforms, Cultural Heritage Participation, and Social Cohesion,” explore how digital heritage platforms facilitate public participation, promote inclusion, and strengthen social connectedness. The study focuses on the Online Cenotaph, a platform developed by the Auckland War Memorial Museum, which evolved from a static Roll of Honor in 1996 into a dynamic, user-enriched biographical database. As of 2024, the platform contains over 264,000 entries related to 40 conflicts, with nearly 200,000 public contributions of photographs, annotations, and archival information. Through collaborative research, the authors examine user perceptions, behaviors, and expectations, finding that the platform enhances users’ sense of community and offers new dimensions for digital remembrance and historical understanding. Users reported increased appreciation for New Zealand’s diverse military history and felt personally connected to shared narratives. The findings illustrate how digital heritage tools like Online Cenotaph function not only as digital memorials but as active spaces for dialogue, co-creation, and the reinforcement of social cohesion. The authors suggest future studies should investigate broader impacts of such platforms, particularly in fostering digital literacy and inclusive participation across underrepresented groups.

Barbash M. Petrenko N. & Yepyk L (2024) in their study “Cultural Preservation and Digital Heritage: Challenges and Opportunities,” investigate the complex relationship between technological innovation and cultural heritage preservation. Through a comprehensive literature review of recent academic works and relevant case studies, the authors identify both the obstacles and the possibilities inherent in the digitization of cultural assets. Challenges noted include digital obsolescence, limited accessibility, intellectual property issues, data security, and insufficient resources. At the same time, the research highlights significant opportunities, such as the ability of digital tools to enhance the documentation, archiving, and dissemination of cultural artifacts, languages, and intangible traditions.

The study is particularly timely in the context of the Russian-Ukrainian war, where digital heritage initiatives have become vital in safeguarding cultural identity under threat. The findings emphasize that the intersection of geopolitical instability and digital strategy not only serves as a protective mechanism for heritage at risk but also as a long-term pathway for resilience, education, and global engagement with cultural memory.

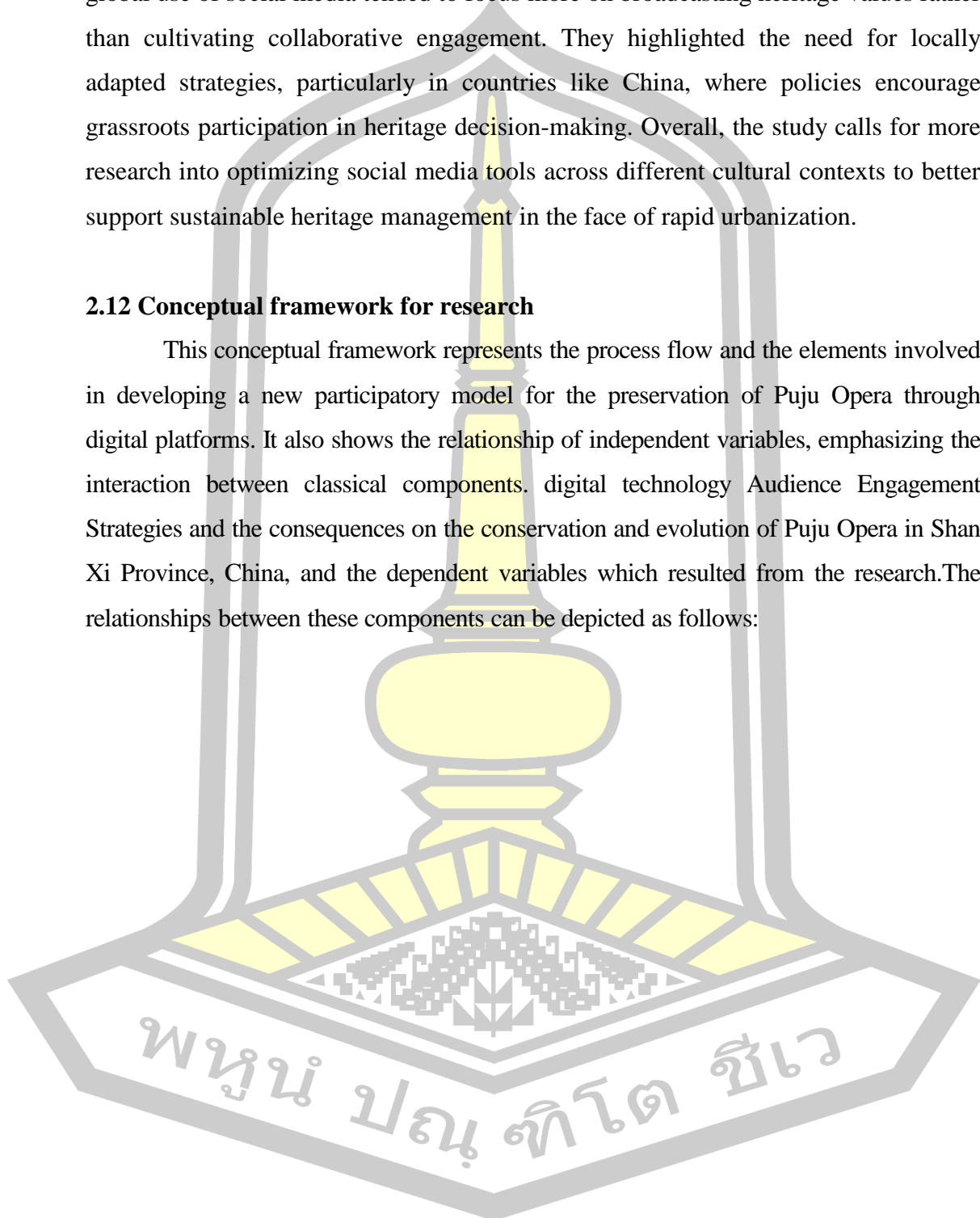
Anwar, and et al. (2025) in their study “Metaverse and XR for Cultural Heritage Education: Applications, Standards, Architecture, and Technological Insights for Enhanced Immersive Experience,” present a comprehensive framework for implementing immersive technologies—including AR, VR, MR, XR, and the metaverse—within cultural heritage education and tourism. The authors emphasize the capacity of these tools to transform learning environments by enhancing user interaction, emotional engagement, and educational motivation. The study reviews emerging trends, technical standards, and architectural models that guide the effective integration of immersive technologies in heritage contexts. It outlines best practices for user experience assessment, referencing structured methodologies and standardized protocols recommended by international organizations. Additionally, the research proposes a system architecture for XR-based heritage applications designed to help developers and educators bridge geographical divides and create rich, participatory learning experiences. Ultimately, the article contributes critical insights for both academic and industry stakeholders, advocating for the use of immersive environments as a catalyst for meaningful engagement with cultural memory.

Liang, Lu, and Martin (2021) conducted a comprehensive review of the role of social media in supporting the sustainability of cultural heritage. Their study systematically analyzed 39 cases across 19 articles, revealing that social media platforms have become crucial tools for community engagement, heritage documentation, and the dissemination of cultural values. The authors found that platforms such as Facebook were widely utilized to foster participatory experiences and promote public involvement in heritage conservation, although application in the context of urban landscapes remained limited. Notably, the study emphasized the importance of a people-centered approach, advocating for greater inclusivity and the recognition of cultural diversity within digital heritage initiatives. While UNESCO

has championed community cohesion, the researchers observed that much of the global use of social media tended to focus more on broadcasting heritage values rather than cultivating collaborative engagement. They highlighted the need for locally adapted strategies, particularly in countries like China, where policies encourage grassroots participation in heritage decision-making. Overall, the study calls for more research into optimizing social media tools across different cultural contexts to better support sustainable heritage management in the face of rapid urbanization.

2.12 Conceptual framework for research

This conceptual framework represents the process flow and the elements involved in developing a new participatory model for the preservation of Puju Opera through digital platforms. It also shows the relationship of independent variables, emphasizing the interaction between classical components, digital technology Audience Engagement Strategies and the consequences on the conservation and evolution of Puju Opera in Shan Xi Province, China, and the dependent variables which resulted from the research. The relationships between these components can be depicted as follows:



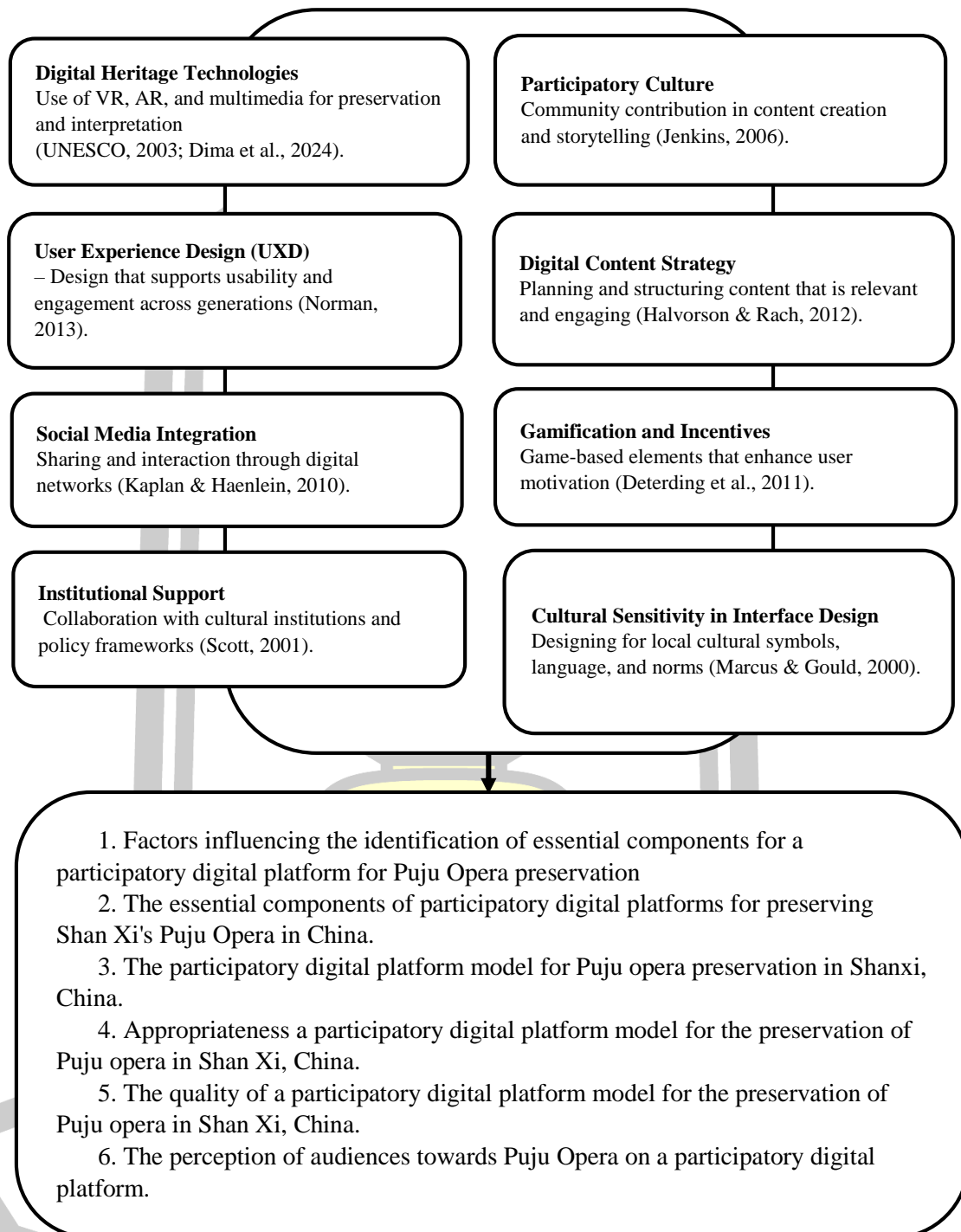


Figure 2. 13 Conceptual framework Flowchart

CHAPTER 3

Research Methodology

The research methodology employed a mixed-method approach, involving document analysis, expert interviews, and surveys on key components of a participatory digital platform model for preserving the Puju opera in Shanxi, China. The study also assessed the model's quality and audience's perception of the Puju opera on the participatory digital platform. The following research steps were implemented

3.1 Population

The target population for this study consisted of audiences and digital platform users interested in the preservation of Puju Opera in Shanxi, China. It was divided into 2 main groups:

3.1.1 General Audience

The general audience was categorized into 3 generational groups based on age:

- 1.1.1 Gen X: Aged between 45–60 years
- 1.1.2 Gen Y: Aged between 29–44 years
- 1.2.3 Gen Z: Aged between 13–28 years

3.1.2 Experts in Five Key Fields

A group of experts from five specialized fields provided insights into the essential components required for a participatory digital platform. These experts evaluated the appropriateness of the model and assessed the quality of the developed application designed for the preservation of Puju Opera in Shanxi, China. The expert group included:

- 1) Puju Opera specialists
- 2) Digital platform developers
- 3) Cultural conservationists
- 4) Digital communication specialists
- 5) Anthropologists or social science researchers

3.2 Sample Group

The study selected three main groups of participants:

3.2.1 Group 1: WeChat Audience (at least 400 participants)

This group consisted of users who were members of the WeChat platform, providing data on the essential components of a participatory digital platform for Puju Opera preservation.

Sampling Method: Convenience Sampling – Participants were selected based on their accessibility to the WeChat platform and their willingness to participate.

3.2.2 Group 2: Application Testers (at least 400 participants)

This group consisted of users who tested the Puju Opera Digital Platform on WeChat and evaluated their perceptions and user experience.

Sampling Method: Stratified Sampling – The participants were divided into three generational groups (Gen X, Gen Y, Gen Z) to examine differences in perception, engagement, and attitudes towards Puju Opera preservation.

3.2.3 Group 3: Expert Panel (9 participants)

This group included 9 specialists who provided in-depth insights and expert evaluations, including:

- 1) Five Puju Opera experts
- 2) One digital platform developer
- 3) One cultural conservationist
- 4) One digital communication specialist
- 5) One anthropologist or social science researcher

Sampling Method: Purposive Sampling – Experts were intentionally selected based on their professional expertise and relevance to the study.

This structured sampling approach ensured that the study captured diverse perspectives from both general audiences and experts, allowing for a comprehensive evaluation of the participatory digital platform model for Puju Opera preservation in Shanxi, China.

3.3 Research Variables

The research includes 6 variables, as follows:

3.3.1 Factors influencing the identification of essential components for a participatory digital platform for Puju Opera preservation

3.3.2 The essential components of participatory digital platforms for preserving Shan Xi's Puju Opera in China.

3.3.3 The participatory digital platform model for Puju opera preservation in Shanxi, China.

3.3.4 Appropriateness a participatory digital platform model for the preservation of Puju opera in Shan Xi, China.

3.3.5 The quality of a participatory digital platform model for the preservation of Puju opera in Shan Xi, China.

3.3.6 The perception of audiences towards Puju Opera on a participatory digital platform.

3.4 Research Tools

The research employed 7 tools

3.4.1 In-depth interviews with Shanxi community members and experts on the essential components of a participatory digital platform for the preservation of Puju Opera in Shanxi, China.

3.4.2 Audience opinion assessment form on the essential components for developing a participatory digital platform for the preservation of Puju Opera in Shanxi, China.

3.4.3 The participatory digital platform model for the preservation of Puju Opera in Shanxi, China.

3.4.4 Appropriateness assessment form for the participatory digital platform model.

3.4.5 A participatory digital platform for the preservation of Puju Opera in Shanxi, China, developed based on the identified model framework.

3.4.6 Application quality assessment form for the participatory digital platform.

3.4.7 Audience perception assessment form on Puju Opera on the participatory digital platform.

3.5 Development and Validation of Research Tools

The research instruments were developed and validated through the following steps:

3.5.1 In-depth interviews with Shanxi community members and experts on the essential components of a participatory digital platform for the preservation of Puju Opera in Shanxi, China

This in-depth interview was conducted to explore the essential components of a participatory digital platform aimed at preserving Puju Opera in Shanxi, China. The data collection involved interviews with nine experts, including (1) five Puju Opera specialists, (2) one digital platform developer, (3) one cultural conservationist, (4) one digital communication specialist, and (5) one digital marketing expert, along with 15 members of the Shanxi community. The following steps were undertaken to develop the interview guidelines.

1) Reviewing Concepts and Principles : The researcher examined concepts and principles related to key components of a participatory digital platform for preserving Puju Opera in Shanxi, China, to define the scope and content of the interview guide.

2) Defining Interview Topics: Interview topics were divided into two sections:

Part :1 General information about the interviewee, utilizing a -5 item checklist.

Part :2 Structured questions focusing on expert opinions regarding the platform's essential components, covering five main areas: (1 core platform components for Puju Opera preservation, (2 user engagement features, (3 cultural conservation of Puju Opera, (4 platform quality evaluation, and (5 platform usability.

3) Quality Assurance by Advisors: The interview guide was submitted to advisors for quality checks, and revisions were made according to their recommendations before distribution to experts.

4) Validation by Experts: Experts reviewed the interview guide for content accuracy and alignment with the interview's objectives.

5) Final Adjustments: The interview guide was refined and finalized based on expert feedback before actual implementation.

3.5.2 Audience opinion assessment form on the essential components for developing a participatory digital platform for the preservation of Puju Opera in Shanxi, China

The survey aimed to evaluate audience's opinions on critical components of the participatory digital platform for Puju Opera preservation in Shanxi, China, and involved data collection from at least 400 participants aged 13-60. The survey was developed through the following steps:

1) Reviewing Concepts and Principles

The researcher analyzed relevant theories and principles regarding the platform's essential components to define the content and scope for audience's survey.

2) Formulating Survey Questions

The survey consisted of three parts:

Part : 1 Basic information, using a -5 item checklist (gender, age, education level, occupation, experience with digital cultural preservation platforms).

Part :2 Questions on critical platform components, rated on a -5 point Likert scale, focusing on five dimensions: (1 core platform elements for Puju Opera preservation, (2 user engagement, (3 cultural conservation, (4 platform quality evaluation, and (5platform usability. The Evaluation Scale:

Table 3. 1 Evaluation criteria for opinions and interpretation criteria for meaning

Evaluation Criteria for Opinions	Interpretation Criteria for Meaning
= 5Strongly Agree	= 5.00-4.51Strongly Agree
= 4Agree	= 4.50-3.51Agree
= 3Neutral	= 3.50-2.51Neutral
= 2Disagree	= 2.50-1.51Disagree
= 1Strongly Disagree	= 1.50-1.00Strongly Disagree

Part : 3 Additional comments, allowing respondents to provide suggestions beyond the evaluated items.

3) Quality Check by Advisors: The survey was reviewed by advisors, and adjustments were made before expert validation.

4) Content Validity by Experts: Experts assessed the survey's content validity using the Index of Item-Objective Congruence (IOC) for alignment with objectives. Questions with IOC scores of 1.00-0.70 were considered valid.

5) Pre-testing and Reliability Assessment: The survey was pre-tested with a sample resembling the main group (at least %10 or 40 participants). Cronbach's alpha was used to measure reliability, with a minimum reliability criterion of .0.70

6) Data Collection: The validated survey was implemented for data collection.

3.5.3 The participatory digital platform model for the preservation of Puju Opera in Shanxi, China

The development of a participatory digital platform model aimed to preserve and promote the cultural heritage of Puju Opera by targeting young audiences to raise awareness and encourage engagement through a digital platform. The development process included the following steps:

1) The researcher studied relevant concepts, principles, and research on developing participatory digital platform models for cultural preservation. This process also involved analyzing in-depth interview data from experts and survey results from audience about essential components of a digital platform for Puju Opera preservation. This information guided the identification of key elements for the model, and the researcher was actively developing a participatory digital platform model.

2) The researcher summarized the findings to develop the prototype model of a participatory digital platform aimed at preserving Puju Opera in Shanxi, China.

3) The developed prototype model of a participatory digital platform for the conservation of Puju Opera in Shanxi, China, was submitted to the thesis advisor for verification, ensuring its accuracy and relevance. The prototype was subsequently revised to address any deficiencies based on the advisor's recommendations.

4) The revised prototype model of the participatory digital platform for Puju Opera conservation in Shanxi, China, was then submitted to five experts for

evaluation. These experts included: (1) a Puju Opera specialist, (2) a digital platform developer, (3) a cultural conservationist, (4) a digital communication expert, and (5) a digital marketing and information dissemination expert. Each expert was assessing and suggesting adjustments to the model using a 5-point Likert scale questionnaire, which evaluated the suitability of the participatory digital platform model for Puju Opera conservation in Shanxi, China, according to predetermined criteria.

Table 3. 2 Evaluation criteria for opinions and interpretation criteria for meaning

Criteria for Evaluating Opinions	Interpretation Criteria
5 = Highly Suitable	4.51-5.00 = Highly Suitable
4 = Very Suitable	3.51-4.50 = Very Suitable
3 = Moderately Suitable	2.51-3.50 = Moderately Suitable
2 = Slightly Suitable	1.51-2.50 = Slightly Suitable
1 = Least Suitable	1.00-1.50 = Least Suitable

5) The revised model of the participatory digital platform for preserving Shanxi's Puju Opera in China was presented to five experts for verification. These experts were asked to evaluate the model using the same assessment tool for determining the appropriateness of the participatory digital platform model for Puju Opera preservation in Shanxi, China.

3.5.4 Appropriateness assessment form for the participatory digital platform model.

The purpose of creating the model appropriateness assessment was to evaluate the appropriateness of the participatory digital platform model for preserving Puju Opera in Shanxi, China. Data was collected from five experts with the following qualifications: 1) a Puju Opera specialist, 2) a digital platform developer, 3) a cultural preservation expert, 4) a digital communication specialist, and 5) a digital marketing and information dissemination expert. This step ensured the model's validity before its wider application. The researcher carried out the creation of the model suitability assessment, following these steps:

1) The researcher studied relevant concepts and principles related to the participatory digital platform model for opera preservation, including insights from in-depth interviews with experts and survey data from audience on critical components for a digital platform to preserve Puju Opera. This data was used to define the scope and content of the model suitability assessment.

2) The researcher formulated questions aligned with the content and objectives, dividing the assessment into three parts as follows:

Part 1: Basic Information – a checklist with five items: 1) gender, 2) age, 3) educational level, 4) profession, and 5) experience in cultural preservation through digital media.

Part 2: Questions on the Model's Suitability – a 5-point Likert scale evaluating five aspects: 1) components of the digital platform for Puju Opera preservation, 2) user features and participation, 3) cultural preservation of Puju Opera, 4) platform quality assessment, and 5) platform usability. The evaluation criteria and interpretation standards were also defined.

Table 3. 3 Evaluation criteria for appropriateness and interpretation criteria for meaning

Criteria for Evaluating Appropriateness	Interpretation Criteria
5 = Highly Suitable	4.51-5.00 = Highly Suitable
4 = Very Suitable	3.51-4.50 = Very Suitable
3 = Moderately Suitable	2.51-3.50 = Moderately Suitable
2 = Slightly Suitable	1.51-2.50 = Slightly Suitable
1 = Least Suitable	1.00-1.50 = Least Suitable

Part 3: Additional Feedback – space for experts to provide suggestions for further improvement beyond the items listed in Part 2.

3) The completed assessment form was sent to the thesis advisor for quality review, after which the researcher made adjustments based on their feedback to finalize the assessment for expert use.

4) The assessment was then distributed to experts to evaluate content validity, ensuring that the questions aligned with the intended objectives, with scores ranging from 1 to -1. Questions with content accuracy achieved an IOC (Index of Item-Objective Congruence) close to 1.00, and the researcher set an IOC threshold between 0.70-1.00.

5) The validated assessment was then used for data collection.

3.5.5 The participatory digital platform for the preservation of Puju Opera in Shanxi, China, developed based on the identified model framework

The aim of developing the participatory digital platform was to design and create a digital space to promote the preservation of Puju Opera in Shanxi, China. This initiative specifically targeted audience to raise awareness and encourage engagement through the platform. The researcher developed this platform based on the participatory digital platform model designed for Puju Opera preservation. This process involved examining concepts and principles of participatory platform design for cultural preservation, analyzing in-depth interviews with experts, and surveying audience's opinions on essential platform components to establish the key elements of the digital platform. The researcher followed 5 stages in the development process:

Stage 1: Preliminary Analysis and Research

- 1) Studied the identity and history of Puju Opera to understand its cultural context, including its importance within the local community in Shanxi.
- 2) Analyzed the behaviors and needs of the target users, particularly audience, to define platform features that would support engagement and usability.
- 3) Examined existing digital platforms related to cultural preservation and online engagement to adapt relevant features for the platform.

Stage 2: Preliminary Platform Design

- 1) Designed the screen layout and user interface (UI/UX) with simplicity in mind, aligning it with the cultural connection for the target audience.
- 2) Defined the platform's main features, including content display, interactive elements like commenting and content sharing, and hosting online events for Puju Opera enthusiasts.
- 3) Created digital content about Puju Opera, including videos, historical narratives, and information on artists and performances.

Stage 3: Platform Development and Testing

1) Developed the platform using relevant technologies, such as website or application programming, and built functionality to support user interaction.

2) Conducted user testing with young individuals and cultural experts to gather feedback and suggestions for platform improvement.

3) Made adjustments and added features based on testing results, refining areas that required improvement to enhance usability.

Stage 4: Platform Launch and Promotion

1) Launched the platform via online media, allowing users to access and experiment with it.

2) Created awareness using marketing strategies, such as social media campaigns or events related to Pujua Opera, to increase platform visibility.

3) Collected user feedback and usage data to evaluate the platform's effectiveness and make necessary improvements to better meet user needs.

Stage 5: Ongoing Support and Participation Tracking

1) Organized online events to foster engagement, such as virtual seminars about Pujua Opera or live-stream performances through the platform.

2) Monitored user activity to track the community's growth and gather feedback for future adjustments.

3) Regularly updated content and features to maintain user interest and align with evolving user needs.

Table 3. 4 Home page participatory digital platform

Page name	level	Page trigger	Function name	alternative events	function declaration	remark
home page	1	tap Bottom operating bar "Home Page"	Pu opera category	show	Show Pu drama character categories	
			Category introduction	tap Click the TAB	Flip the TAB, Displays the description of the current category	

Page name	level	Page trigger	Function name	alternative events	function declaration	remark
Introduction to Puju	2	Click the home carousel card "Pu Opera Introduction"	Introduction to Puju	show	Show Pu opera introduction text And picture	
Puju study	2	Click the home carousel card "Pu Drama learning"	Puju study	show	Show a list of videos to learn Puju techniques	
			video display	Click list video	1. Click the list video to open the video to watch; 2. After opening the video to watch, the list of videos is marked as "learned" (learned videos can be viewed in the "Personal Center - My Learning" function)	The runtime data is stored in the cache, and reloading the applet will cause the learned video data to be emptied)
watch video	3	Click the Puju learning page video	watch video	show	Show and watch videos	

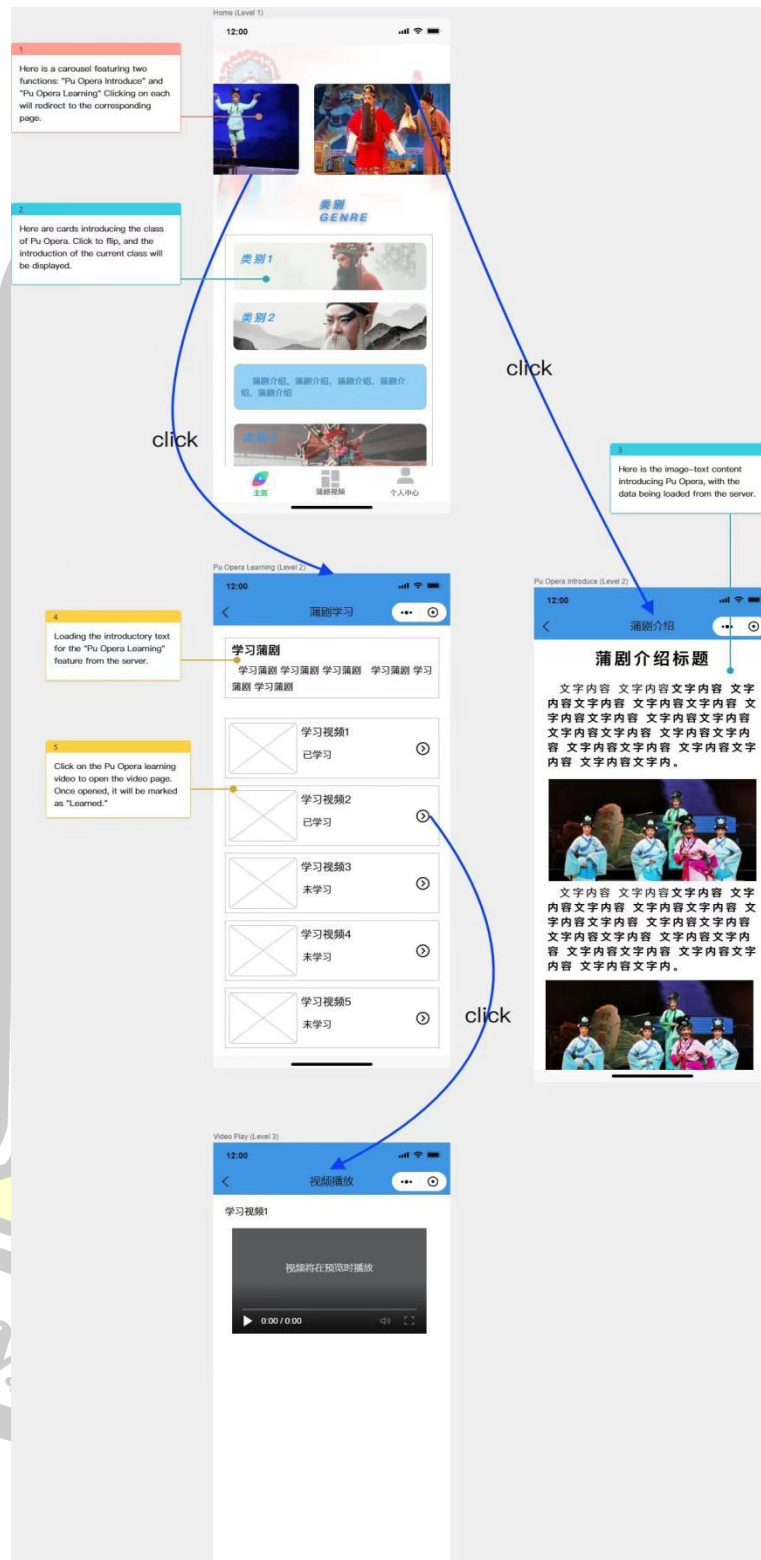


Figure 3. 1 User Interactive: Home page participatory digital platform

Table 3. 5 Pu opera video participatory digital platform

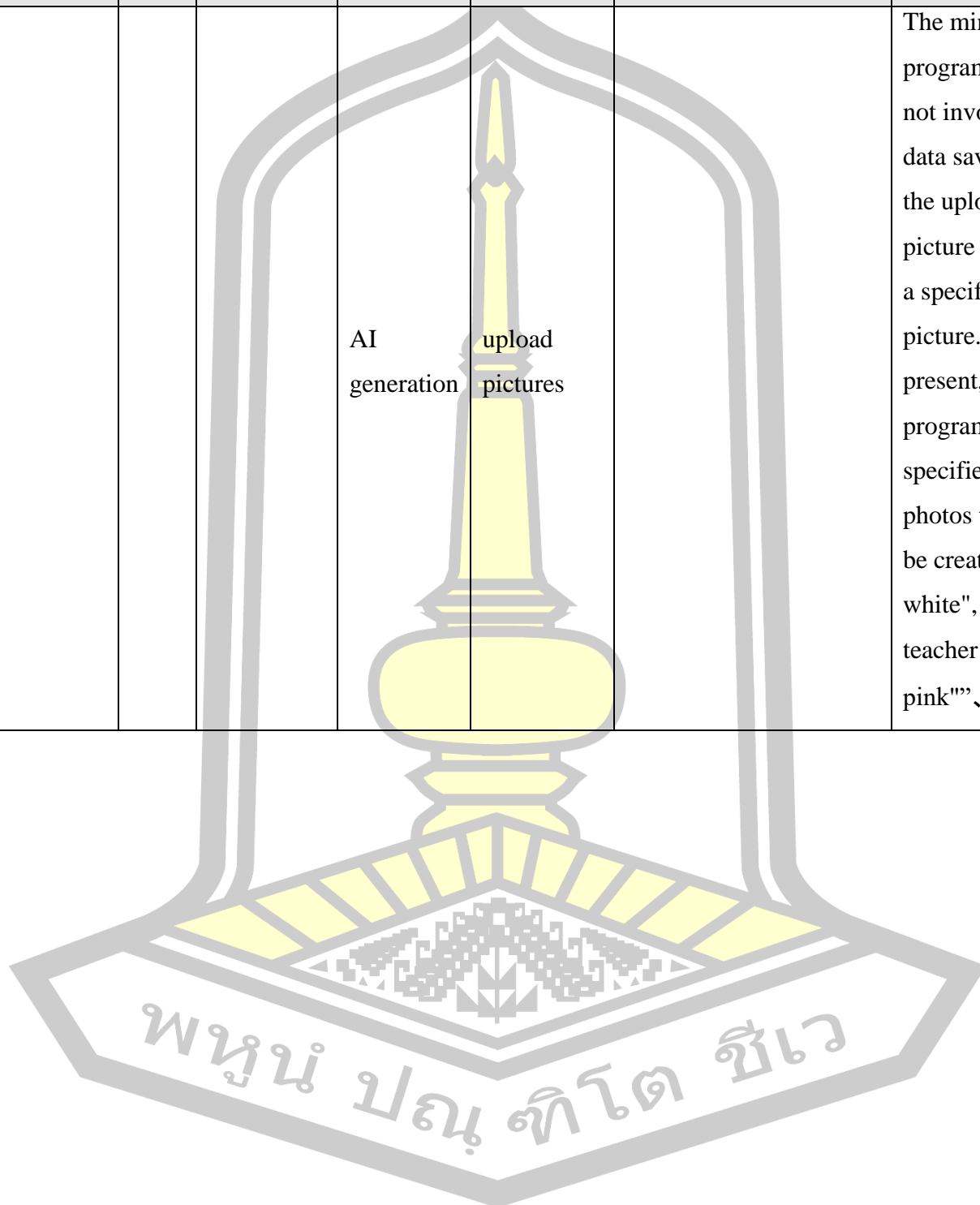
Page name	level	Page trigger	Function name	alternative events	function declaration	remark
Pu opera video	1	tap Bottom operating bar "Pu Drama Video""	Pu opera video	Click the top navigation bar to switch pages	Show "Classic Drama" "Solo Duo" "Shoot Video" Three function pages	
Classic drama	1	Click "Classic Episodes" at the top of Pu Drama video page	Classic episode videos	show	Show a list of Pu opera classic videos	
			video display	Click list video	1. Click the list video to open the video to watch; 2. After opening the video to watch, the list of videos is marked as "watched".	
			Video collection	Long press list video	Bookmark/unbookmark videos (Collected videos can be viewed in the "Personal Center - My Favorites" feature)	The runtime data is stored in the cache, and reloading the applet causes the saved video data to empty
			video retrieval	Click search bar	Enter a keyword and click Search Submit to filter videos that match that keyword	
watch	2	Click on	watch	show	Show and watch videos	

Page name	level	Page trigger	Function name	alternative events	function declaration	remark
video		the classic episode page video	video			
Solo innovation	1	Click "Personal second creation" at the top of the Pu drama video page	Personal second creation video	show	Show a list of personal second creation videos	
			video display	Click list video	Play the video, the number of views of the video after playing the video +1	
			Video rating	Click on the star icon	The videos are rated and the average score in the list page is updated after the rating	1. 1. At the beginning, the video rating and the number of raters are randomly given. After scoring, the average score will be adjusted according to the original score; 2. The runtime data is stored in the cache, and reloading the applet results in a score

Page name	level	Page trigger	Function name	alternative events	function declaration	remark
			Video likes	Click the thumb icon	Appreciate/unappreciate videos, and the number of subsequent videos appreciated ± 1 (appreciated videos can be viewed in the "Personal Center - My Likes" feature)	The runtime data is stored in the cache, and reloading the applet causes the appreciated video data to be emptied
			Focus on users	Press and hold the video publisher's avatar	Follow/unfollow users (users who have followed can be viewed in the "Personal Center - My Followers" function)	The runtime data is stored in the cache, and reloading the applet causes the concerned user data to be emptied
shoot a video	1	Click "Shoot video" at the top of Puju video page	My video list	show	Show a list of videos I've posted	The runtime data is stored in the cache, and reloading the applet causes the published video data to be emptied
			upload a video	Click the "Upload Video" button	Upload album videos (Uploaded videos can be viewed in the "Puju Video - Shoot video - My video" and "Puju	The mini program does not involve user data saving, and the uploaded

Page name	level	Page trigger	Function name	alternative events	function declaration	remark
					Video - Personal Creation" functions)	video must be a specified video. Currently, the specified video is My Video 1 and My Video 2. After the specified video is uploaded, the corresponding content is displayed in the uploaded video
			Costume two creation	Click the "Costume 2 Create" button	Open the costume creation page and generate AI costume changing video based on photos	
Second creation of theatrical costumes	2	Click the "Costume 2 Creation" button in the shooting video page	Costume change	Slide the picture left and right to play	Select the costume template used to generate the AI video	
			Stage mode	Click the "Stage Mode" toggle button	Choose whether to turn on Stage mode, if so, a dramatic stage can be generated in the video	

Page name	level	Page trigger	Function name	alternative events	function declaration	remark
			AI generation	upload pictures		The mini program does not involve user data saving, and the uploaded picture must be a specified picture. At present, the mini program specifies 8 fixed photos that can be created for "white", "female teacher - pink",



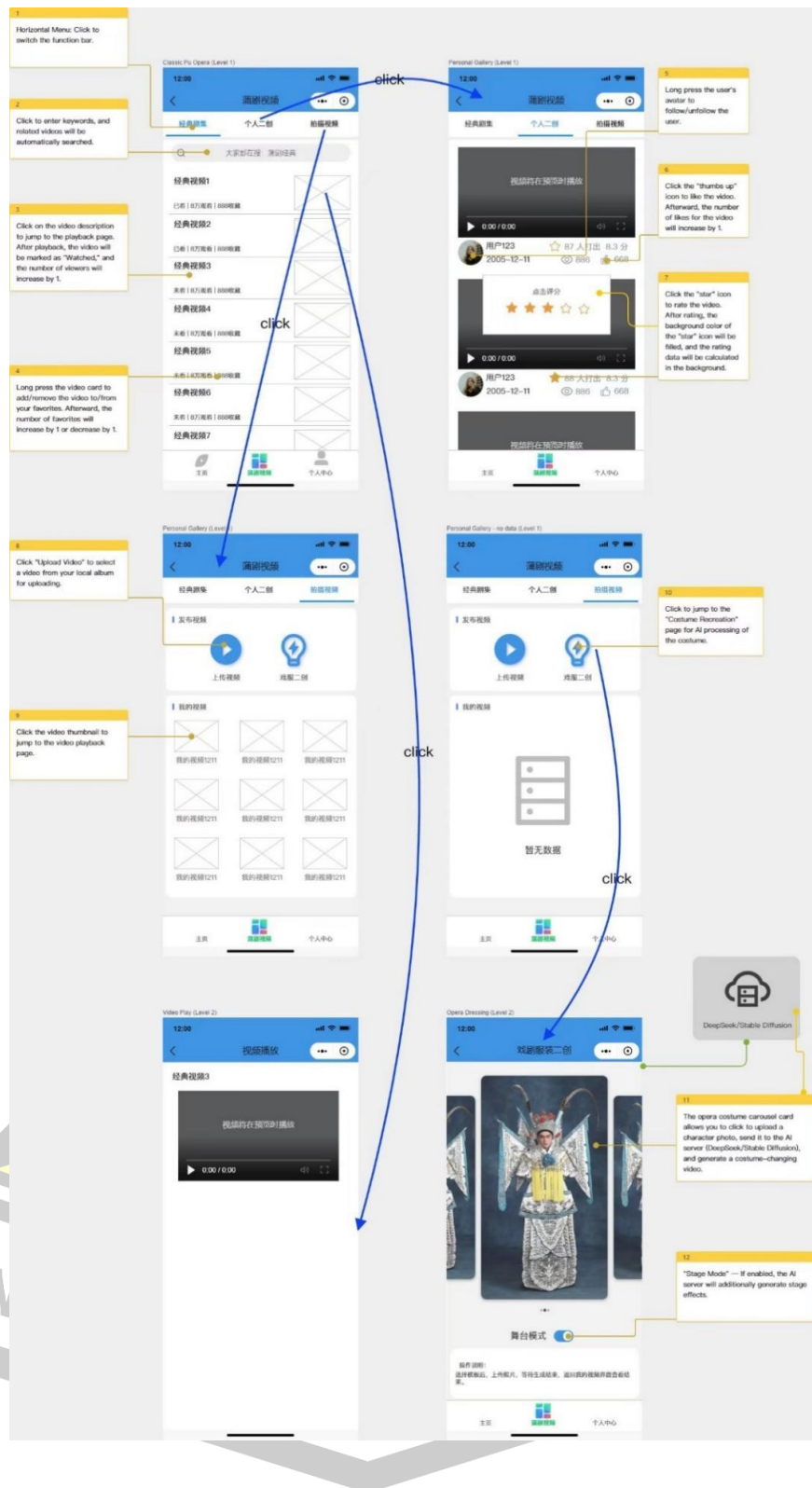


Figure 3. 2 User Interactive: Pu opera video participatory digital platform

Table 3. 6 Personal center participatory digital platform

Page name	level	Page trigger	Function name	alternative events	function declaration	remark
personal center	1	tap Bottom operating bar "Personal center"	personal information	show	Displays the number of personal video favorites, video likes, video learning, and following users	The runtime data is stored in the cache, and reloading the applet causes the favorites, Likes, learns, and Follows data to be emptied
			my favorite	Click the My Favorites button	Open my favorite video list	
			My favorite	Click My Like button	Open my favorite video list	
			my study	Click the My Learn button	Open my list of learned videos	
			my interest	Click the Focus list button	Open my list of followed users	
my favorite	2	Click the "My Favorites" button on the Personal	Favorite videos	show	Show a list of my favorite videos	

Page name	level	Page trigger	Function name	alternative events	function declaration	remark
		Center page				
watch video	3	Click on My Favorites list video	watch video	show	Show and watch videos	
My favorite	2	Click the "My Likes" button on the Personal Center page	Already liked video	show	Show a list of my favorite videos	
watch video	3	Click on My favorite list videos	watch video	show	Show and watch videos	
my study	2	Click the "My Learning" button on the Personal Center page	Learned video	show	Show a list of my learned videos	
watch video	3	Click on my Learning list video	watch video	show	Show and watch video	
my interest	2	Click the "Follow List" button on your personal center page	Followed user	show	Show a list of my followed users	

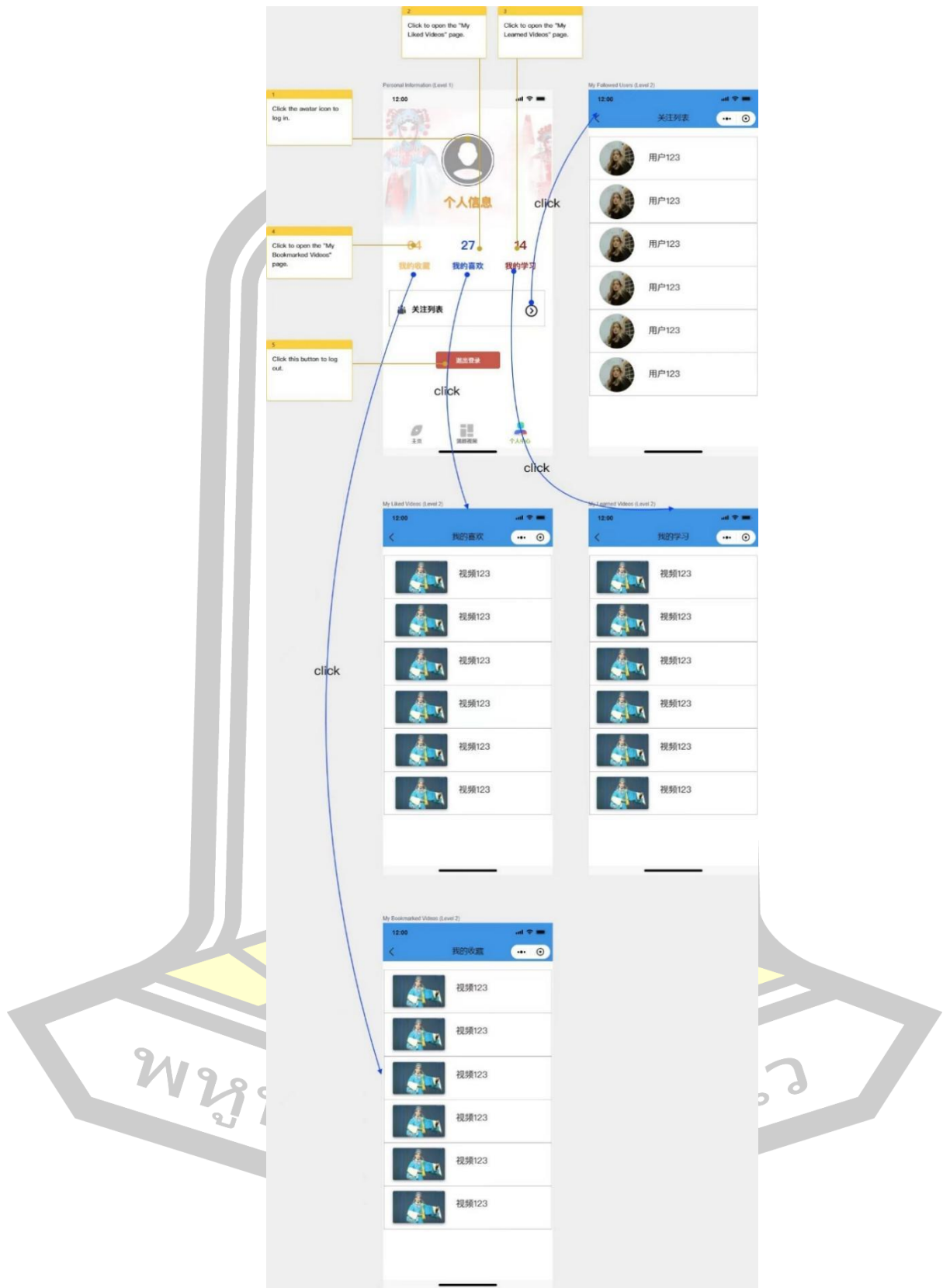


Figure 3. 3 User Interactive: Personal center participatory digital platform

3.5.6 Application quality assessment form for the participatory digital platform.

The quality assessment was designed to evaluate the participatory digital platform for Puju Opera preservation in Shanxi, China. The evaluation gathered data from five experts through interviews, comprising: 1) a Puju Opera specialist, 2) a digital platform developer, 3) a cultural preservationist, 4) a digital communication expert, and 5) a digital marketing and information dissemination expert. The development of the quality assessment followed these steps:

1) Studied concepts and principles related to participatory digital platforms for opera preservation to inform the scope and content of the quality assessment.

2) Formulated questions aligning with the content and objectives, dividing the assessment into three sections:

Section 1: Basic Information, a checklist of four items: 1) Gender, 2) Age, 3) Education level, and 4) Occupation.

Section 2: Questions on the quality of the participatory digital platform for Puju Opera preservation in Shanxi, China. This section used a five-point Likert scale and covered 5 areas: 1) Key components of the digital platform for Puju, 2) Opera preservation, User characteristics and engagement, 3) Cultural preservation of Puju Opera, 4) Platform quality assessment, and 5) Platform usability. The evaluation criteria and interpretation standards were also defined.

Table 3. 7 Quality Assessment Criteria and Meaning Interpretation Criteria

Criteria for Evaluating Quality	Interpretation Criteria
5 = Very High Quality	4.51-5.00 = Very High Quality
4 = High Quality	3.51-4.50 = High Quality
3 = Moderate Quality	2.51-3.50 = Moderate Quality
2 = Low Quality	1.51-2.50 = Low Quality
1 = Very Low Quality	1.00-1.50 = Very Low Quality

Section 3: Additional Comments — This section allows respondents to provide any additional suggestions beyond the evaluation items in Section 2.

3) Sent the completed quality assessment to an advisor for review. The researcher made revisions based on the advisor's feedback before distributing the assessment to experts.

4) Distributed the quality assessment to experts for evaluation of content validity. Each question's content relevance was measured to align with the intended objectives, with an Index of Content Validity (IOC) range of -1 to 1. Items with IOC scores near 1.00 indicated high content relevance, with the researcher setting acceptable IOC values between 0.70 and 1.00.

5) After validation, the researcher used the quality-assessed instrument for data collection.

3.5.7 Audience perception assessment form on Puju Opera on the participatory digital platform.

The perception assessment aimed to gauge audience's awareness of Puju Opera preservation on a participatory digital platform. Data collection was conducted with at least 400 audience aged 13-60. The researcher followed these steps to develop the perception assessment:

1) Studied concepts and principles regarding audience's perception of Puju Opera preservation on a participatory digital platform, which guided the scope and content for creating the perception assessment.

2) Formulated questions aligning with the content and objectives, dividing the assessment into three sections:

Section 1: Basic Information — A checklist with five items: 1) Gender, 2) Age, 3) Education level, and 4) Occupation.

Section 2: Questions about audience's perception of Puju Opera preservation. This section used a five-point Likert scale, covering five areas:

Table 3. 8 Perception Assessment Criteria and Meaning Interpretation Criteria

Criteria for Evaluating Perception	Interpretation Criteria
5 = Very High Perception	4.51-5.00 = Very High Perception
4 = High Perception	3.51-4.50 = High Perception
3 = Moderate Perception	2.51-3.50 = Moderate Perception

Criteria for Evaluating Perception	Interpretation Criteria
2 = Low Perception	1.51-2.50 = Low Perception
1 = Very Low Perception	1.00-1.50 = Very Low Perception

Section 3: Additional Comments — This section invites respondents to provide further suggestions beyond the items evaluated in Section 2.

3) Sent the completed audience's perception assessment to an advisor for quality review. The researcher revised the assessment based on the advisor's feedback before submitting it to experts.

4) Distributed the perception assessment to experts for content validity evaluation, ensuring each question aligns with the intended objectives. The content relevance was measured using an Index of Content Validity (IOC) ranging from -1 to 1. Questions closely matching the content objectives had IOC values close to 1.00, with acceptable scores set between 0.70 and 1.00.

5) Refined the audience's perception assessment and conducted a tryout with a sample group resembling the main study sample, comprising at least 10% of the main sample size, or a minimum of 40 individuals. The results were analyzed to determine the reliability of the perception assessment using Cronbach's alpha for responses on a 5-point Likert scale (Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1), with reliability set between 0.70 and 1.00.

6) After confirming the quality, the assessment was deployed for data collection.

3.6 Risk Prevention Measures for the Sample Group

To mitigate potential risks for the sample group during research participation, the researcher established specific criteria for selecting young autistic participants.

These criteria include:

- 3.6.1 Participants must be young individuals aged 10-22 years, of any gender.
- 3.6.2 Participants must voluntarily agree to join the research project.
- 3.6.3 Participants must be capable of using digital platforms and social media.
- 3.6.4 Participants should have basic experience with smartphones or tablets.

3.6.5 Participants may have difficulties with spatial relationships, such as recognizing positions, similarities, and differences.

3.6.6 For participants under 18, parental or legal guardian consent is required.

3.7 Data Collection

The data collection process for this research is conducted in four phases as follows:

Phase 1: Study key components of participatory digital platform model for the preservation of Puju Opera in Shanxi, China.

1. In-depth interviews with Shanxi community members and experts

Collect data through in-depth interviews with five experts in the following fields: 1) Puju Opera expertise, 2) Digital platform development, 3) Cultural conservation, 4) Digital communication, 5) Digital marketing and information dissemination. Experts were interviewed regarding the key components of a participatory digital platform for Puju Opera conservation in Shanxi, China. Each expert provided voluntary consent to participate. The data collection procedure was as follows:

1.1 The researcher contacted experts to schedule interview dates and sent the interview guide along with an information sheet outlining the interview process.

1.2 On the interview day, each expert signed a consent form before participating in an approximately one-hour interview discussing the essential components of the digital platform for Puju Opera conservation in Shanxi, China.

1.3 After completing the interviews, the researcher reviewed the responses for completeness.

1.4 Once the interview results were analyzed, the researcher shared the findings with each expert for validation and approval.

2. Survey of Audience's Opinions

Data was collected from at last 400 audience's participants using an online survey about key components of a participatory digital platform for Puju Opera conservation in Shanxi, China. The survey included an introductory section explaining the study's purpose, the types of data collected, data privacy, data security

measures, respondent rights, and a consent confirmation before beginning the assessment. The data collection steps were as follows:

2.1 The researcher posted the online survey about key platform components for Puju Opera conservation on social media platforms.

2.2 After reaching the target of 400 responses, the researcher reviewed the responses for question completeness and data accuracy before closing the online survey.

Phase : 2 Evaluate the participatory digital platform model for the preservation of Puju Opera in Shanxi, China.

Once the researcher had developed a participatory digital platform model for conserving Puju Opera in Shanxi, China, an assessment of the model's appropriateness was conducted before establishing it as a conceptual framework. This assessment guided the researcher in developing strategies for a collaborative digital platform. To evaluate the platform model, data were collected from experts using the following steps:

1. The researcher contacted experts to schedule an appropriate time for assessing the platform model.
2. On the scheduled date, the researcher provided the experts with the participatory digital platform model to evaluate its suitability.
3. After the experts completed the evaluation, the researcher checked the assessment for completeness, including reviewing feedback and recommendations for refining the participatory digital platform model.

Phase : 3 Evaluate the participatory digital platform for conserving Shanxi Puju Opera in China

After successfully developing a participatory digital platform for conserving Puju Opera in Shanxi, China, based on the conceptual framework, the researcher evaluated the platform's quality before applying it to the sample group. For this quality assessment, data were collected from experts following these steps:

- .1 The researcher contacted experts to schedule a time for evaluating the quality of the participatory digital platform for conserving Puju Opera in Shanxi.
2. On the appointed date, the researcher presented the participatory digital platform to the experts for quality evaluation.

3. Once the experts completed their evaluation, the researcher reviewed the assessment for completeness and gathered suggestions for further improvements to refine the digital platform.

Phase 4: Evaluating the perception of audiences towards Puju Opera on a participatory digital platform.

Once the participatory digital platform for conserving Puju Opera in Shanxi, China, had successfully undergone expert quality assessment and refinement based on feedback, it was ready for public use. The researcher proceeded to evaluate audience's perceptions of Puju Opera conservation on the platform by using a perception assessment survey. This online survey included a description of the study's purpose, types of collected data, information about privacy protection, data storage, respondent rights, and consent acknowledgment. The data collection process was as follows:

1. The researcher published the participatory digital platform online on social media platforms for audience to interact with and test.
2. A perception assessment survey about audience's views on Puju Opera conservation through the participatory digital platform was posted on social media to collect data from a sample of 400 young participants.
3. Once responses reached the target of 400 participants, the researcher reviewed the survey responses for completeness and accuracy before closing the online survey.

3.8 Data Analysis

After collecting research data, the researcher analyzed the results as follows:

3.8.1 Analysis of In-Depth Interviews with Shanxi community members and experts on Key Components of the Participatory Digital Platform for Conserving Shanxi Puju Opera in China

Once the data was collected, the researcher categorized it into two sections for analysis:

- 1) Section :1Basic Information of Evaluators

Quantitative data was analyzed to find frequency and percentage values, with results presented numerically to support descriptions.

2) Section : 2 Structured Interview Questions on Shanxi community members and Expert Opinions

Structured interview questions were used to gather expert opinions on the essential components of the participatory digital platform for Puju Opera conservation in Shanxi, China. This qualitative data was organized by interview themes, and a content analysis was conducted to identify relationships among similar answers as well as divergent views. The findings were summarized and reported descriptively to illustrate the phenomenological responses.

3.8.2 Analysis of Survey Results on Audience's Opinions on the Key Components of the Participatory Digital Platform for Conserving Shanxi Puju Opera

After collecting data, the researcher divided it into three sections for analysis:

1) Section :1Basic Information of Evaluators

Quantitative data was analyzed by calculating frequencies and percentages, with results displayed numerically to provide context.

2) Section :2Opinions of Audience on Key Platform Components (-5Point Likert Scale)

The researcher analyzed quantitative data on audience's opinions regarding key platform components by calculating the mean and standard deviation, presenting the results in numerical format to aid interpretation.

3) Section :3Additional Comments

This section included qualitative data, which was analyzed using content analysis. The researcher summarized and presented the findings descriptively to capture the observed phenomena.

3.8.3 Analysis of the Appropriateness of the Participatory Digital Platform Model for Conserving Puju Opera in Shanxi, China

After data collection, the researcher divided the data into three sections for analysis:

1) Section :1Basic Information of Evaluators

The researcher conducted quantitative analysis by calculating frequency and percentage values, presenting the data in numerical form to support the explanation.

2) Section :2Questions on the Appropriateness of the Participatory Digital Platform Model

Using a -5 point Likert scale, the researcher analyzed responses regarding the suitability of the digital platform model for Puju Opera conservation in Shanxi. The analysis included calculating the mean and standard deviation, with results presented in numerical form for clarity.

3) Section :3Additional Comments

Qualitative data from open-ended comments was analyzed using content analysis. The researcher summarized and descriptively presented the findings to illustrate observed phenomena.

3.8.4 Analysis of the Quality of the Participatory Digital Platform for Preservation Puju Opera in Shanxi, China

Following data collection, the researcher organized the data into three sections for analysis:

1) Section :1Basic Information of Evaluators

Quantitative analysis was conducted by calculating frequency and percentage values, with the results presented in numerical form to support explanation.

2) Section :2Questions on the Quality of the Participatory Digital Platform

Using a -5 point Likert scale, the researcher analyzed the evaluators' responses regarding the quality of the digital platform for Puju Opera conservation in Shanxi. The analysis included calculating the mean and standard deviation, with the results displayed in numerical form for clear interpretation.

3) Section :3Additional Comments

Qualitative feedback from open-ended responses was analyzed through content analysis. The researcher summarized and descriptively presented the findings to illustrate observed phenomena and insights.

3.8.5 Analysis of Audience's Perception of Puju Opera Conservation on the Participatory Digital Platform

After data collection, the researcher organized the data into three sections for analysis:

1) Section :1Basic Information of the Evaluators

Quantitative analysis was conducted by calculating frequency and percentage values, with results presented in numerical form to support the description.

2) Section :2Questions on Audience's Perception of Pujua Opera Conservation

Using a -5point Likert scale, the researcher analyzed the perception data of audience regarding Pujua Opera conservation on the participatory digital platform. The analysis involved calculating the mean and standard deviation, with numerical results provided for clear interpretation.

3.9 Statistical Methods for Data Analysis

For quantitative data, the researcher applied descriptive statistics as follows:

3.9.1 Content Validity

Content validity was determined by ensuring the alignment of the questions with the intended objectives and the proportional importance of each content area. This was achieved through calculating the Index of Item-Objective Congruence (IOC), assessing the consistency between each question and its objective.

3.9.2 Reliability

To measure the consistency of the assessment scores across multiple instances, Cronbach's Alpha coefficient was used to determine the reliability of the scale.

3.9.3 Frequency

Frequency values were calculated to show the occurrence rates of specific responses within the dataset.

3.9.4 Percentage

Percentage values were used to present the data distribution clearly and comparatively.

3.9.5 Arithmetic Mean

The arithmetic mean was calculated to provide an average value, offering insight into the central tendency of the data.

3.9.6 Standard Deviation

Standard deviation was determined to assess the dispersion of responses, indicating the variation or spread around the mean.

CHAPTER 4

Results

The study titled "Developing a Participatory Digital Platform Model for the Preservation of Puju Opera in Shan Xi, China" presented four key findings that aligned with and addressed the research objectives as follows:

4.1 Findings on the essential components of participatory digital platforms for preserving Shan Xi's Puju Opera in China

4.1.1 Audience Opinions on the Essential Components for Developing a Participatory Digital Platform Dedicated to the Preservation of Puju Opera in Shan Xi, China

The research findings were obtained through the collection of opinions and perspectives from three generational groups, comprising a total of 512 participants. Specifically, Generation X (Gen X) included 109 participants, Generation Y (Gen Y) comprised 206 participants, and Generation Z (Gen Z) consisted of 206 participants. The study focused on identifying the essential components required for developing a participatory digital platform dedicated to preserving Puju Opera in Shan Xi, China. The researcher presented the following key findings.

Table 4. 1 The basic demographic information for Gen X was obtained from 109 respondents.

Name	Basic information	Frequency	Percent
1. Gender:	Female	36	33
	Male	34	31
	Other	39	36
Total		109	100
2. Age:	45-49	35	32
	50-54	34	31
	55-60	40	37
Total		109	100

Name	Basic information	Frequency	Percent
3.Educational Level:	Undergraduate	24	22
	Graduate	30	28
	High School	25	23
	Other	30	28
Total		109	100
4.Occupation:	Student	37	34
	Working Professional	29	27
	Other	43	39
		109	100
5.Experience with Digital Platforms for Cultural Preservation:	No	70	64
	Yes	39	36
Total		109	100
6. A participatory digital platform is essential for preserving Puju Opera in Shan Xi, China.	No	53	49
	Yes	56	51
Total		109	100

The findings from Table 4.1 revealed a balanced gender distribution among Gen X respondents (109), with 36% identifying as other, 33% as female, and 31% as male. The largest age group was 55–60 years (37%), followed by 45–49 years (32%) and 50–54 years (31%). Education levels varied, with 28% holding graduate degrees, 28% classified as "other," 23% completing high school, and 22% holding undergraduate degrees. Occupationally, 39% were in the "other" category, 34% were students, and 27% were working professionals. A majority (64%) had never used digital platforms for cultural preservation, while 36% had prior experience. Views on the necessity of a participatory digital platform for Puju Opera preservation were nearly split, with 51% supporting it and 49% disagreeing.

Table 4. 2 Gen X's Opinions on the Key Components of an Interactive Digital Platform for Paju Opera Conservation

Section	Components of the Participatory Digital Platform	Opinion Level		Meaning
		n=109		
		Mean	S.D.	
Essential Components of the Digital Platform for Paju Opera Preservation				
1	1.1 The platform should provide detailed historical information about Paju Opera.	3.81	0.85	Agree
	1.2 The platform should include interactive features to engage users.	3.66	0.83	Agree
	1.3 The platform must ensure ease of access to cultural resources for all users.	3.71	0.88	Agree
	1.4 The platform should incorporate multimedia content, such as videos and images.	3.70	0.88	Agree
	1.5 The platform should be user-friendly and accessible to diverse age groups.	3.71	0.88	Agree
Total		3.72	0.86	Agree
Features and User Engagement				
2	2.1 The platform should include social media integration to increase user participation.	3.70	0.84	Agree
	2.2 Gamification features can enhance user interaction with Paju Opera content.	3.72	0.90	Agree
	2.3 The platform should allow users to contribute content or feedback to enrich the platform.	3.74	0.84	Agree
	2.4 Notifications and updates should keep users informed about new content or features.	3.61	0.81	Agree
	2.5 Customizable user profiles can help tailor content to individual preferences.	3.72	0.86	Agree
Total		3.70	0.85	Agree
3	Cultural Preservation of Paju Opera			

Section	Components of the Participatory Digital Platform	Opinion Level		Meaning
		n=109		
		Mean	S.D.	
	3.1 The platform should highlight the cultural significance of Puju Opera to younger generations.	3.70	0.89	Agree
	3.2 The platform must provide educational resources to help users understand Puju Opera.	3.62	0.87	Agree
	3.3 The platform should collaborate with cultural experts to ensure the accuracy of content.	3.57	0.80	Agree
	3.4 The preservation efforts through the platform should align with traditional values.	3.64	0.86	Agree
	3.5 The platform should foster collaboration with other cultural organizations.	3.69	0.85	Agree
	Total	3.65	0.85	Agree
	Platform Quality Assessment			
	4.1 The platform should be evaluated for its usability and ease of navigation.	3.69	0.86	Agree
	4.2 User satisfaction should be regularly measured through surveys or feedback.	3.66	0.84	Agree
4	4.3 The platform should be assessed for its effectiveness in raising awareness of Puju Opera.	3.75	0.88	Agree
	4.4 Performance metrics such as user engagement and content reach should be regularly monitored.	3.58	0.82	Agree
	4.5 The quality of multimedia content (images, videos) should meet high professional standards.	3.76	0.84	Agree
	Total	3.69	0.84	Agree
	Platform Usage			
5	5.1 The platform should offer a comprehensive user guide or tutorial for easy navigation.	3.73	0.89	Agree
	5.2 The platform should allow users to easily access Puju Opera-related content.	3.70	0.87	Agree

Section	Components of the Participatory Digital Platform	Opinion Level		Meaning
		n=109		
		Mean	S.D.	
5.3	Privacy policies must protect user data and ensure safe usage.	3.77	0.86	Agree
5.4	The platform should offer opportunities for learning and understanding Puju Opera.	3.68	0.87	Agree
5.5	Technical support should be available to users to address any issues.	3.63	0.87	Agree
Total		3.70	0.87	Agree
Overall Total		3.69	0.85	Agree

Table 4.2 presented the overall results of Gen X's opinions on the key components of a participatory digital platform for Puju Opera conservation. Respondents expressed a high level of agreement (Mean = 3.69, S.D. = 0.85) regarding the development of the platform. Their feedback on individual components was as follows:

1. Essential Components of the Digital Platform

Gen X respondents strongly agreed (Mean = 3.72, S.D. = 0.86) with the necessity of key platform components. The highest-rated aspect was the inclusion of detailed historical information about Puju Opera (Mean = 3.81, S.D. = 0.85), which highlighted a strong interest in educational and informational content, other important elements, such as ease of access (Mean = 3.71, S.D. = 0.88) and multimedia content integration (Mean = 3.70, S.D. = 0.88), also received high ratings, interactive features for user engagement received a slightly lower score (Mean = 3.66, S.D. = 0.86), suggesting that while engagement is valuable, it may not be the top priority for Gen X respondents.

2. User Engagement Features

Gen X respondents strongly agreed (Mean = 3.70, S.D. = 0.85) on the importance of user engagement. User-generated content and feedback (Mean = 3.74, S.D. = 0.84) ranked as the most important engagement feature, reflecting a preference

for community-driven content. Gamification features (Mean = 3.72, S.D. = 0.90) and customizable user profiles (Mean = 3.72, S.D. = 0.86) were also considered beneficial for enhancing engagement. Notifications and updates (Mean = 3.61, S.D. = 0.81) received the lowest rating, indicating that while useful, they were not deemed essential for the platform.

3. Cultural Preservation of Puju Opera

Gen X respondents strongly agreed (Mean = 3.65, S.D. = 0.85) with the importance of preserving Puju Opera. Highlighting the cultural significance of Puju Opera for younger generations (Mean = 3.70, S.D. = 0.89) was a primary concern. Collaboration with cultural experts (Mean = 3.57, S.D. = 0.80) received the lowest score in this category, indicating that while expert involvement was valued, it was not the most urgent priority for respondents.

4. Platform Quality Assessment

Gen X respondents strongly agreed (Mean = 3.69, S.D. = 0.84) on the importance of platform quality. The highest-rated aspect was ensuring high-quality multimedia content (Mean = 3.76, S.D. = 0.84), emphasizing the importance of professional digital content standards, assessing the platform's effectiveness in raising awareness (Mean = 3.75, S.D. = 0.88) was also considered a key priority, monitoring engagement metrics (Mean = 3.58, S.D. = 0.82) received the lowest rating, suggesting that while tracking platform performance is beneficial, users prioritized content quality over analytics.

5. Platform Usage

Gen X respondents strongly agreed (Mean = 3.70, S.D. = 0.87) on the importance of platform usability and security. Data privacy and security (Mean = 3.77, S.D. = 0.86) ranked as the top priority, reinforcing the need for robust cybersecurity measures, a comprehensive user guide (Mean = 3.73, S.D. = 0.89) also received high ratings, highlighting the necessity of clear navigation instructions, availability of technical support (Mean = 3.63, S.D. = 0.87) had the lowest score in this section, indicating that while useful, it was not a primary concern.

The findings underscored the need for a content-rich, user-friendly, and high-quality participatory digital platform for Puju Opera conservation. The historical and cultural aspects should serve as the core foundation, complemented by interactive and

community-driven engagement features. Ensuring multimedia quality, security, and accessibility will further enhance user trust and adoption. These insights provide a clear direction for the development of an effective platform that meets the expectations of Gen X users while fulfilling its mission to preserve Puju Opera in Shan Xi, China.

Table 4. 3 The basic demographic information for Gen Y was obtained from 206 respondents.

Name	Basic information	Frequency	Percent
1. Gender:	Female	93	45
	Male	74	36
	Other	39	19
Total		206	100
2. Age:	29-33	108	52
	34-38	64	31
	39-44	34	17
Total		206	100
3. Educational Level:	Graduate	36	17
	High School	55	27
	Other	88	43
	Undergraduate	27	13
Total		206	100
4. Occupation:	Student	79	38
	Working Professional	74	36
	Other	53	26
Total		93	45
5. Experience with Digital Platforms for Cultural Preservation:	No	74	36
	Yes	39	19
Total		206	100
6. A participatory digital platform is essential for	No	61	30
	Yes	145	70

Name	Basic information	Frequency	Percent
	preserving Puju Opera in Shan Xi, China.		
Total		206	100

The findings from Table 4.3, which examined the demographic characteristics of the Gen Y group (206 respondents), showed that females constituted the largest proportion (45%), followed by males (36%) and other gender identities (19%). The most common age group was 29–33 years (52%), while 31% were aged 34–38 years, and 17% were 39–44 years old. Regarding education, 43% fell under the "other" category, 27% had completed high school, 17% held graduate degrees, and 13% had undergraduate degrees. In terms of occupation, 38% were students, 36% were working professionals, and 26% were classified under "other." Experience with digital platforms for cultural preservation was relatively low, with only 19% reporting prior experience, while 36% had never used such platforms. However, the majority (70%) believed that a participatory digital platform was essential for preserving Puju Opera in Shanxi, China, while 30% did not find it necessary.

Table 4. 4 Gen Y's Opinions on the Key Components of an Interactive Digital Platform for Puju Opera Conservation

Section Components of the Participatory Digital Platform	Opinion Level		Meaning	
	n=206			
	Mean	S.D.		
Essential Components of the Digital Platform for Puju Opera Preservation				
1	1.1 The platform should provide detailed historical information about Puju Opera.	4.26	0.44	Agree
	1.2 The platform should include interactive features to engage users.	4.17	0.38	Agree
	1.3 The platform must ensure ease of access to cultural resources for all users.	4.14	0.35	Agree

Section Components of the Participatory Digital Platform	Opinion Level		Meaning
	n=206		
	Mean	S.D.	
1.4 The platform should incorporate multimedia content, such as videos and images.	4.16	0.37	Agree
1.5 The platform should be user-friendly and accessible to diverse age groups.	4.26	0.44	Agree
Total	4.20	0.40	Agree
Features and User Engagement			
2.1 The platform should include social media integration to increase user participation.	4.13	0.34	Agree
2.2 Gamification features can enhance user interaction with Puju Opera content.	4.16	0.37	Agree
2 2.3 The platform should allow users to contribute content or feedback to enrich the platform.	4.17	0.37	Agree
2.4 Notifications and updates should keep users informed about new content or features.	4.17	0.37	Agree
2.5 Customizable user profiles can help tailor content to individual preferences.	4.11	0.32	Agree
Total	4.15	0.35	Agree
Cultural Preservation of Puju Opera			
3.1 The platform should highlight the cultural significance of Puju Opera to younger generations.	4.10	0.30	Agree
3.2 The platform must provide educational resources to help users understand Puju Opera.	4.17	0.38	Agree
3 3.3 The platform should collaborate with cultural experts to ensure the accuracy of content.	4.22	0.41	Agree
3.4 The preservation efforts through the platform should align with traditional values.	4.17	0.37	Agree
3.5 The platform should foster collaboration with other cultural organizations.	4.19	0.39	Agree

Section Components of the Participatory Digital Platform		Opinion Level		Meaning
		n=206		
		Mean	S.D.	
Total		4.17	0.37	Agree
Platform Quality Assessment				
	4.1 The platform should be evaluated for its usability and ease of navigation.	4.19	0.39	Agree
	4.2 User satisfaction should be regularly measured through surveys or feedback.	4.13	0.34	Agree
4	4.3 The platform should be assessed for its effectiveness in raising awareness of Puju Opera.	4.12	0.33	Agree
	4.4 Performance metrics such as user engagement and content reach should be regularly monitored.	4.13	0.34	Agree
	4.5 The quality of multimedia content (images, videos) should meet high professional standards.	4.16	0.37	Agree
Total		4.14	0.35	Agree
Platform Usage				
	5.1 The platform should offer a comprehensive user guide or tutorial for easy navigation.	4.17	0.38	Agree
	5.2 The platform should allow users to easily access Puju Opera-related content.	4.21	0.41	Agree
5	5.3 Privacy policies must protect user data and ensure safe usage.	4.20	0.40	Agree
	5.4 The platform should offer opportunities for learning and understanding Puju Opera.	4.14	0.34	Agree
	5.5 Technical support should be available to users to address any issues.	4.17	0.37	Agree
Total		4.18	0.38	Agree
Overall Total		4.16	0.37	Agree

The results from Table 4.4 reflected the overall opinions of Gen Y regarding the key components of a participatory digital platform for Puju Opera conservation.

Respondents strongly agreed on the necessity of developing such a platform, with an overall Mean of 4.16 (S.D. = 0.37). This indicated a high level of consensus on the importance of creating a dedicated platform for Puju Opera preservation across all five key aspects. A closer examination of each component revealed the following findings.

1. Essential Components of the Digital Platform (Mean = 4.20, S.D. = 0.40)

Gen Y respondents strongly agreed on the importance of key platform components. Notably: Detailed historical information (Mean = 4.26, S.D. = 0.44) and user accessibility (Mean = 4.26, S.D. = 0.44) received the highest ratings, indicating that users prioritized accurate, comprehensive knowledge and ease of use, other essential elements, including interactive features (Mean = 4.17, S.D. = 0.38) and multimedia content (Mean = 4.16, S.D. = 0.37), were also valued, emphasizing a preference for engaging content.

2. Features and User Engagement (Mean = 4.15, S.D. = 0.35)

Gen Y respondents recognized the value of social media integration (Mean = 4.13, S.D. = 0.34) and gamification (Mean = 4.16, S.D. = 0.37) for enhancing user engagement, user-generated content (Mean = 4.17, S.D. = 0.37) was considered crucial, suggesting a strong inclination toward community-driven contributions, customizable user profiles (Mean = 4.11, S.D. = 0.32) received slightly lower ratings, indicating it was useful but not the highest priority.

3. Cultural Preservation of Puju Opera (Mean = 4.17, S.D. = 0.37)

Collaboration with cultural experts (Mean = 4.22, S.D. = 0.41) received the highest rating, reflecting the importance of authoritative and accurate content, providing educational resources (Mean = 4.17, S.D. = 0.38) and highlighting cultural significance for younger generations (Mean = 4.10, S.D. = 0.30) were also prioritized, aligning preservation efforts with traditional values (Mean = 4.17, S.D. = 0.37) reinforced the necessity of maintaining authenticity in digital conservation efforts.

4. Platform Quality Assessment (Mean = 4.14, S.D. = 0.35)

The highest-rated aspect in this category was usability and ease of navigation (Mean = 4.19, S.D. = 0.39), emphasizing user-friendliness as a key concern, monitoring performance metrics (Mean = 4.13, S.D. = 0.34) and assessing

effectiveness in raising awareness (Mean = 4.12, S.D. = 0.33) were also valued, indicating that respondents expected continuous evaluation and refinement of the platform.

5. Platform Usage (Mean = 4.18, S.D. = 0.38)

Privacy and data security (Mean = 4.20, S.D. = 0.40) was highly prioritized, showing concerns over online safety, providing comprehensive user guides (Mean = 4.17, S.D. = 0.38) and technical support (Mean = 4.17, S.D. = 0.37) were also considered essential for ensuring accessibility and reliability.

The results suggest that Gen Y strongly supports the development of a participatory digital platform for Puju Opera conservation. The most critical components included historical accuracy, expert collaboration, multimedia content, ease of navigation, and data security. Additionally, features such as social media integration, gamification, and user-generated content were recognized as valuable for enhancing engagement. The findings provide a clear direction for designing a platform that balances cultural preservation, user accessibility, and interactive engagement, ensuring its effectiveness in promoting Puju Opera conservation among younger generations.

Table 4. 5 The basic demographic information for Generation Z was obtained from 206 respondents.

Name	Basic information	Frequency	Percent
1. Gender:	Female	53	26
	Male	103	50
	Other	50	24
Total		206	100
2. Age:	13-17	82	40
	18-22	78	38
	23-28	46	22
Total		206	100
3. Educational Level:	Undergraduate	36	17
	Graduate	55	27

Name	Basic information	Frequency	Percent
	High School	88	43
	Other	27	13
	Total	206	100
4.Occupation:	Student	79	38
	Working Professional	74	36
	Other	53	26
	Total	206	100
5. Experience with Digital Platforms for Cultural Preservation:	No	110	53
	Yes	96	47
	Total	206	100
6. A participatory digital platform is essential for preserving Puju Opera in Shan Xi, China.	No	55	27
	Yes	151	73
	Total	206	100

The findings from Table 4.5, which examined the demographic characteristics of the Gen Z group (206 respondents), indicated that males represented the largest proportion (50%), followed by females (26%) and other gender identities (24%). The most common age group was 13–17 years (40%), followed by 18–22 years (38%), and 23–28 years (22%). In terms of education, 43% had completed high school, 27% held graduate degrees, 17% had undergraduate degrees, and 13% fell under the "other" category. Regarding occupation, 38% were students, 36% were working professionals, and 26% were classified as "other." A larger proportion (47%) had experience with digital platforms for cultural preservation, compared to 53% who had never used them. Notably, 73% of respondents supported the need for a participatory digital platform for preserving Puju Opera in Shanxi, China, while 27% did not consider it necessary.

Table 4. 6 Gen Z's Opinions on the Key Components of an Interactive Digital Platform for Puju Opera Conservation

Section	Components of the Participatory Digital Platform	Opinion Level		Meaning
		n=206		
		Mean	S.D.	
Essential Components of the Digital Platform for Puju Opera Preservation				
1	1.1 The platform should provide detailed historical information about Puju Opera.	4.33	0.47	Agree
	1.2 The platform should include interactive features to engage users.	4.16	0.37	Agree
	1.3 The platform must ensure ease of access to cultural resources for all users.	4.12	0.33	Agree
	1.4 The platform should incorporate multimedia content, such as videos and images.	4.15	0.36	Agree
	1.5 The platform should be user-friendly and accessible to diverse age groups.	4.13	0.33	Agree
Total		4.18	0.38	Agree
Features and User Engagement				
2	2.1 The platform should include social media integration to increase user participation.	4.11	0.31	Agree
	2.2 Gamification features can enhance user interaction with Puju Opera content.	4.16	0.37	Agree
	2.3 The platform should allow users to contribute content or feedback to enrich the platform.	4.12	0.33	Agree
	2.4 Notifications and updates should keep users informed about new content or features.	4.13	0.33	Agree
	2.5 Customizable user profiles can help tailor content to individual preferences.	4.16	0.37	Agree
Total		4.14	0.34	Agree
3	Cultural Preservation of Puju Opera			

Section	Components of the Participatory Digital Platform	Opinion Level		Meaning
		n=206		
		Mean	S.D.	
	3.1 The platform should highlight the cultural significance of Puju Opera to younger generations.	4.13	0.34	Agree
	3.2 The platform must provide educational resources to help users understand Puju Opera.	4.10	0.31	Agree
	3.3 The platform should collaborate with cultural experts to ensure the accuracy of content.	4.13	0.34	Agree
	3.4 The preservation efforts through the platform should align with traditional values.	4.12	0.33	Agree
	3.5 The platform should foster collaboration with other cultural organizations.	4.19	0.40	Agree
	Total	4.14	0.34	Agree
	Platform Quality Assessment			
	4.1 The platform should be evaluated for its usability and ease of navigation.	4.15	0.36	Agree
	4.2 User satisfaction should be regularly measured through surveys or feedback.	4.16	0.37	Agree
4	4.3 The platform should be assessed for its effectiveness in raising awareness of Puju Opera.	4.12	0.33	Agree
	4.4 Performance metrics such as user engagement and content reach should be regularly monitored.	4.18	0.38	Agree
	4.5 The quality of multimedia content (images, videos) should meet high professional standards.	4.13	0.34	Agree
	Total	4.15	0.36	Agree
	Platform Usage			
5	5.1 The platform should offer a comprehensive user guide or tutorial for easy navigation.	4.13	0.33	Agree
	5.2 The platform should allow users to easily access Puju Opera-related content.	4.12	0.33	Agree

Section	Components of the Participatory Digital Platform	Opinion Level		Meaning
		n=206		
		Mean	S.D.	
5.3	Privacy policies must protect user data and ensure safe usage.	4.24	0.43	Agree
5.4	The platform should offer opportunities for learning and understanding Puju Opera.	4.16	0.37	Agree
5.5	Technical support should be available to users to address any issues.	4.14	0.35	Agree
Total		4.16	0.36	Agree
Overall Total		4.15	0.36	Agree

The results from Table 4.6 indicated that Gen Z respondents strongly agreed with the necessity of a participatory digital platform for Puju Opera conservation, with an overall (Mean=4.15, S.D. = 0.36). When evaluating the five key areas, respondents expressed their opinions on each component as follows:

1. Essential Components of the Digital Platform for Puju Opera Preservation

Gen Z respondents agreed on the importance of a well-structured platform with a Mean of 4.18 (S.D. = 0.38). The highest-rated feature was detailed historical information about Puju Opera (Mean = 4.33, S.D. = 0.47), demonstrating a strong interest in educational resources, other key elements, such as interactive features (Mean = 4.16, S.D. = 0.37) and multimedia content (Mean = 4.15, S.D. = 0.36), were also highly rated, indicating the need for engaging digital experiences, accessibility for diverse age groups was seen as essential (Mean = 4.13, S.D. = 0.33), suggesting the importance of inclusivity in platform design.

2. Features and User Engagement

The respondents agreed that the platform should include various engagement features, with a Mean of 4.14 (S.D. = 0.34), gamification (Mean = 4.16, S.D. = 0.37) and customizable user profiles (Mean = 4.16, S.D. = 0.37) were viewed as highly beneficial, suggesting that Gen Z prefers an interactive and personalized experience, social media integration (Mean = 4.11, S.D. = 0.31) and user-generated content (Mean

= 4.12, S.D. = 0.33) were seen as crucial, reflecting Gen Z's preference for participatory platforms, notifications and updates (Mean = 4.13, S.D. = 0.33) were also valued, reinforcing the importance of keeping users informed about new content.

3. Cultural Preservation of Puju Opera

The importance of cultural conservation was strongly supported, with a Mean of 4.14 (S.D. = 0.34). Collaboration with other cultural organizations (Mean = 4.19, S.D. = 0.40) was the highest-rated aspect, suggesting that Gen Z sees institutional partnerships as critical for authenticity and long-term sustainability, highlighting the cultural significance for younger generations (Mean = 4.13, S.D. = 0.34) was highly regarded, emphasizing the role of digital tools in fostering awareness, providing educational resources (Mean = 4.10, S.D. = 0.31) and ensuring alignment with traditional values (Mean = 4.12, S.D. = 0.33) were also key priorities.

4. Platform Quality Assessment

Respondents rated platform quality highly, with a Mean of 4.15 (S.D. = 0.36). Monitoring engagement and content reach (Mean = 4.18, S.D. = 0.38) was seen as crucial, suggesting that performance analytics should be a core feature, user satisfaction surveys (Mean = 4.16, S.D. = 0.37) and high multimedia quality (Mean = 4.13, S.D. = 0.34) were also emphasized, indicating the need for a professional standard in digital content, usability and ease of navigation (Mean = 4.15, S.D. = 0.36) were key considerations for an intuitive user experience.

5. Platform Usage

The usability and functionality of the platform received high agreement, with a Mean of 4.16 (S.D. = 0.36). Privacy and data protection (Mean = 4.24, S.D. = 0.43) received the highest rating in this section, indicating that security is a major concern for Gen Z users, comprehensive user guides (Mean = 4.13, S.D. = 0.33) and easy access to Puju Opera content (Mean = 4.12, S.D. = 0.33) were also key factors in usability, technical support availability (Mean = 4.14, S.D. = 0.35) was rated lower compared to privacy and security, but still considered important.

The findings suggest that Gen Z respondents strongly supported the development of a participatory digital platform for Puju Opera conservation. Their priorities revolved around historical and cultural content, interactive features, and

high multimedia quality. Security and privacy were of paramount importance, alongside engagement tools such as gamification and user-generated content.

Gen X, Gen Y, and Gen Z agreed on the importance of developing a participatory digital platform for Puju Opera conservation, with all three groups expressing strong agreement across key components. They consistently prioritized historical accuracy, multimedia integration, and ease of access as essential elements of the platform. Additionally, all groups recognized the significance of user-generated content and gamification features in fostering engagement. However, differences emerged in certain aspects. Gen Y and Gen Z placed higher importance on interactive features and real-time user participation, whereas Gen X valued structured historical content and professional oversight more significantly. Furthermore, Gen Z showed the strongest preference for social media integration and customization options, while Gen X emphasized data security and privacy concerns more than the younger generations. These findings suggested that while all three generations supported the platform's development, their expectations for content and engagement strategies varied, requiring a balanced approach in platform design.

Analytical Summary of Key Components for Developing a Participatory Digital Platform Model for the Preservation of Puju Opera in Shan Xi i Province, China

Based on the statistical analysis of findings presented in Tables 4.2, 4.4, and 4.6, five essential components have been identified as priorities for developing a participatory digital platform dedicated to the conservation of Puju Opera:

1. Digital Archives & Learning Ecosystem

Definition: This component refers to a foundational digital system that stores and presents historical materials, opera scripts, photographs, performance videos, and interactive learning resources. Its goal is to support accessible and sustainable knowledge transmission of Puju Opera.

Findings: Participants across all generations emphasized the critical need for a comprehensive and accurate digital archive. Gen X prioritized historical integrity and long-term accessibility. Gen Y showed strong interest in interactive tutorials that combine media and learning tasks. Gen Z preferred dynamic, mobile-friendly content formats over static, documentary-style materials.

2. Gamified User Engagement & Social Storytelling

Definition: This component involves game-based features, storytelling tools, user-generated content, and real-time interactivity through social media, aiming to encourage active participation and a sense of cultural ownership among users.

Findings: Gen Z expressed the highest level of engagement with features such as gamified challenges and collaborative storytelling. Gen Y responded positively to hybrid online-offline events and interactive media. In contrast, Gen X showed less interest, often perceiving these tools as overly complex or overly entertainment-focused.

3. Sustainability, Partnerships & Policy Advocacy

Definition: This pillar focuses on building long-term sustainability through diverse funding sources, partnerships with academic and cultural institutions, and integration with policy frameworks that promote cultural preservation.

Findings: Gen X placed strong emphasis on institutional reliability and sustainable funding. Gen Z highlighted the need for collaborative efforts with universities and community-based organizations. Gen Y preferred innovation-driven partnerships that support platform development through practical policy design.

4. Advanced Technologies & Data Trust Management

Definition: This component incorporates immersive technologies such as AI, VR, and AR, alongside secure data governance using blockchain and privacy protection protocols to ensure both user trust and cultural relevance.

Findings: Gen Y and Gen Z highly valued immersive experiences, particularly those powered by virtual and augmented reality. All generations emphasized the importance of data protection, with Gen X focusing more on personal data security and intellectual property rights, while younger cohorts were drawn to the experiential dimension of the technology.

5. Performance Analytics & Universal Scalability

Definition: This final component involves systems for real-time monitoring, user feedback collection, and platform evaluation. It also supports scalable design for multilingual, cross-cultural, and regional adaptation to reach wider audiences.

Findings: Gen Z valued real-time analytics and responsive content updates, while also advocating for multilingual access and adaptive systems. Gen Y stressed

the importance of performance data to guide continuous platform improvements. Gen X acknowledged the need for scalability but underscored the importance of preserving traditional authenticity in content.

4.1.2 In-Depth Interviews with 15 Shanxi Community Members on the key components of a participatory digital platform for the preservation of Puju Opera in Shanxi, China

The interviews included 15 community members from three generational groups: 5 from Gen X, 5 from Gen Y, and 5 from Gen Z. These participants provided in-depth insights into the essential components required for a participatory digital platform focused on preserving Puju Opera in Shanxi, China. The findings from the in-depth interviews revealed that:

Table 4. 7 Findings from In-Depth Interviews with 15 Shanxi Community Members on the key components of a participatory digital platform for the preservation of Puju Opera in Shanxi, China

Topic/Question	Gen X (Ages 45-60)	Gen Y (Ages 29-44)	Gen Z (Ages 13-28)
1. Components of the Digital Platform			
1.1 Key elements that should be included	A complete digital archive and recorded performances	Streaming systems and related games	TikTok, YouTube Shorts, and influencer promotions
1.2 Aspects that help access knowledge	A deep knowledge database with easy access	Articles explaining stories in an easy-to-understand way	Short videos and engaging animations
2. User Features & Engagement Strategies			
2.1 Features that enhanced engagement	A forum for discussions and knowledge sharing	Social media and reward systems to boost engagement	Gamification and digital rewards
2.2 Best ways to promote participation	Workshops and training through the platform	Competitions and interactive activities	AI-driven content recommendations
3. Cultural Preservation & Long-Term Sustainability			

3.1 Essential elements for conservation	A video archive and historical documents	Voting and review systems for user participation	Interactive platforms with live streaming
3.2 Methods to pass it on to the next generation	Videos and interviews with experts	VR/AR technology for immersive experiences	TikTok and Instagram for communication
3.3 Challenges or difficulties	Accuracy of information and content rights	Platform sustainability and funding	Mobile accessibility and user experience

Topic/Question	Gen X (Ages 45-60)	Gen Y (Ages 29-44)	Gen Z (Ages 13-28)
3.4 Limitations to consider	Preservation of intellectual property rights	Long-term tech updates for sustainability	Content must be concise and to the point

4. Platform Evaluation & Quality Assessment

4.1 Criteria for quality assessment	Completeness and accuracy of information	User numbers and actual engagement	Mobile access and fast page loading
4.2 Aspects that should be evaluated	User engagement and content quality	User satisfaction and engagement rate	Trend creation and social media sharing

5. Usability & Practical Implementation

5.1 Designing for accessibility	Multi-language support and ease of use	Modern design and excellent user experience	Mobile-friendly interface and quick access
5.2 Approaches for effective cultural dissemination	Online courses and digital lessons	Online cultural networks for promotion	Viral content creation and viral marketing
5.3 Personal data management	Authentication system and data encryption	Data leak prevention and proper access control	Opt-in options and strict privacy controls
5.4 Facilitating	Interactive	Customizable	AR/VR integration

quality learning experiences	presentations to enhance learning	learning features	for learning and training
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Table 4.7 summarized the interview findings on the essential components of a digital platform for the preservation of Puju Opera from 15 community members across 3 generations. The results revealed that:

1. Components of the Digital Platform

1.1 Gen X prioritized a comprehensive digital archive with recorded performances and historical records.

1.2 Gen Y preferred streaming services and interactive games to increase engagement.

1.3 Gen Z favored social media platforms like TikTok, YouTube Shorts, and influencer-driven content to attract younger audiences.

2. User Features & Engagement Strategies

2.1 Gen X suggested forums and workshops to encourage discussions and knowledge sharing.

2.2 Gen Y believed social media and reward-based participation would enhance engagement.

2.3 Gen Z relied on gamification, AI-driven recommendations, and digital rewards to keep users involved.

3. Cultural Preservation & Long-Term Sustainability

3.1 Gen X emphasized the accuracy and preservation of historical data to prevent cultural loss.

3.2 Gen Y recommended VR/AR experiences to create immersive storytelling.

3.3 Gen Z relied on live streaming and social media trends to sustain interest in Puju Opera.

4. Platform Evaluation & Quality Assessment

4.1 Gen X considered content accuracy and completeness as key quality indicators.

4.2 Gen Y focused on user participation and content engagement metrics.

4.3 Gen Z evaluated platform accessibility, mobile responsiveness, and social media traction.

5. Usability & Practical Implementation

5.1 Gen X preferred multi-language support and user-friendly navigation.

5.2 Gen Y suggested modern design with networking features for wider cultural outreach.

5.3 Gen Z advocated for mobile-first design, viral content strategies, and AR/VR integration.

Recommendations for Platform Development

1. Establish a digital archive and streaming service to meet Gen X's needs. Incorporate gamification and social media integration to engage Gen Y and Gen Z.

2. Leverage AI, VR/AR, and live streaming to make Puju Opera more accessible and interactive.

3. Ensure platform usability across multiple devices with intuitive design and language support.

4. Implement data security measures and personalized learning experiences to enhance user trust.

A digital platform designed with these elements would effectively preserve and promote Puju Opera, ensuring its cultural significance for future generations.

4.1.3 In-Depth Interviews with 9 experts on the key components of a participatory digital platform for the preservation of Puju Opera in Shanxi, China

The interviews were conducted with 9 experts, including 5 Puju Opera experts, one digital platform developer, one cultural conservationist, one digital communication specialist, and one anthropology or social science researcher. These experts provided insights into the essential components required for a participatory digital platform aimed at preserving Puju Opera in Shanxi, China. The findings from the in-depth interviews revealed that:

Table 4. 8 Results of in-depth interviews with 9 experts on the essential components of a participatory digital platform for the preservation of Puju opera in Shanxi, China

Themes	Expert Consensus	Diverging Perspectives	Key Practical Applications
1. Components of the Digital Platform			
1.1 Key Components of the Digital Platform	<p>1) All experts agreed that the core foundation of the digital platform must include:</p> <p>2) A comprehensive archival system with scripts, historical materials, and multimedia resources.</p> <p>Live streaming & virtual performances to expand global access.</p> <p>3) Community interaction features such as forums, Q&A sessions, and discussion boards.</p> <p>4) Educational content including online courses and cultural training.</p>	<p>1) Puju Opera Experts: Prioritized authenticity and accuracy of content, emphasizing collaboration with historians.</p> <p>2) Digital Platform Developer: Stressed technology scalability and AI-driven recommendations.</p>	Develop centralized digital repositories with AI-powered search and metadata tagging.
1.2 Features to Enhance Knowledge Accessibility	<p>1) Cultural Conservationist & Anthropologist: Advocated for interactive storytelling and AI-powered search functions to enhance cultural understanding.</p> <p>2) Digital</p>		

Themes	Expert Consensus	Diverging Perspectives	Key Practical Applications
	<p>Communication</p> <p>Specialist: Suggested multi-language support and voice-assisted features for inclusivity.</p> <p>3) Digital Platform</p> <p>Developer: Recommended a metadata tagging system to ensure efficient search and categorization.</p>		
2. User Features & Engagement Strategies			
<p>2.1 Features for Active User Participation</p> <p>Agreed Features:</p>	<p>1) User-generated content (UGC) to allow practitioners and enthusiasts to contribute knowledge.</p> <p>2) Gamification elements (badges, leaderboards, rewards) to increase engagement.</p> <p>3) Social media integrations for easy content sharing.</p>	<p>1) Puju Opera Experts: Preferred guided user participation to ensure content authenticity.</p> <p>2) Digital Platform</p> <p>Developer & Communication Specialist: Supported open contributions with AI moderation to balance quality control.</p>	<p>Integrate gamification and AI-based personalized recommendations.</p>
<p>2.2 Best Strategies for Engaging Younger Users</p>	<p>1) Social media challenges & short-form videos (TikTok, Instagram Reels).</p>		

Themes	Expert Consensus	Diverging Perspectives	Key Practical Applications
	2) Collaborations with influencers to attract younger audiences. 3) Hybrid events combining physical and virtual experiences.		
3. Cultural Preservation & Long-Term Sustainability			
3.1 Critical Elements for Cultural Preservation	1) Long-term digital archives to store Pujua Opera materials. 2) Cross-generational knowledge transfer programs connecting young learners with traditional artists. 3) Adaptive learning tools to teach the history and techniques interactively.	Conservationists worry about authenticity loss, while digital specialists emphasize storage and accessibility.	Foster partnerships with academic and cultural institutions for long-term sustainability.
3.2 Digital Platform as a Medium for Knowledge Transmission	1) All Experts Agreed: Digital platforms can bridge generational gaps through multimedia formats. 2) Anthropologist: Highlighted the need for oral history documentation from senior practitioners.		
3.3 Challenges	1) Pujua Opera Experts:		

Themes	Expert Consensus	Diverging Perspectives	Key Practical Applications
in Digital Cultural Preservation	<p>Concerned about the loss of authenticity in digital adaptation.</p> <p>2) Digital Platform Developer: Highlighted the technical challenges of long-term storage and platform scalability.</p> <p>3) Cultural Conservationist: Warned about limited internet access in rural communities affecting accessibility.</p>		
3.4 Considerations for Digital Preservation	<p>1) Legal & ethical considerations (copyright, cultural ownership).</p> <p>2) Funding and institutional support to sustain digital archives.</p> <p>3) Content authenticity verification mechanisms.</p>		
4. Platform Evaluation & Quality Assessment			
4.1 Criteria for Evaluating Platform Quality	<p>1) Content authenticity & accuracy (verified historical materials).</p> <p>2) User engagement & retention metrics (repeat visits, active users).</p>		Use a mix of expert reviews, user surveys, and digital analytics for evaluation.

Themes	Expert Consensus	Diverging Perspectives	Key Practical Applications
	3) Cultural impact analysis (surveys, expert reviews).		
4.2 Key Performance Indicators for Evaluation	1) Pujua Opera Experts & Cultural Conservationist: Prioritized knowledge retention as a key metric. 2) Digital Platform Developer & Communication Specialist: Focused on user experience & interaction analytics.	Opera experts focus on knowledge retention, while tech experts emphasize interaction analytics.	
5. Usability & Practical Implementation			
5.1 Platform Design for Accessibility	1) Mobile-first design to cater to smartphone users. 2) Intuitive UI/UX for ease of navigation. 3) Offline content access for areas with limited internet.		Ensure multi-device compatibility, community-driven moderation, and privacy protection.
5.2 Effective Cultural Transmission Strategies	1) Partnerships with educational institutions for curriculum integration. 2) Live virtual workshops connecting experts and learners. 3) Localized content		

Themes	Expert Consensus	Diverging Perspectives	Key Practical Applications
	formats for different user demographics.		
5.3 Data Privacy & Security Measures	1) Strict user data policies ensuring anonymity where necessary. 2) Blockchain verification for protecting original content. 3) Community-moderated guidelines to prevent misinformation.	Cultural experts favor immersive formats, while developers stress data security and accessibility.	
5.4 Enhancing Learning Experiences	1) Interactive learning modules (quizzes, virtual field trips). 2) AI-driven personalized learning recommendations. 3) Incorporating VR/AR for immersive storytelling.		

The results from Table 4.8 the expert insights on the development of a participatory digital platform model for the preservation of Puju Opera in Shanxi, China revealed key considerations for its design and implementation.

1. Components of the Digital Platform

1.1 Comprehensive digital archive to store historical records, scripts, and artist information

1.2 Live streaming and virtual performances to expand audience reach

1.3 Interactive learning tools for educational purposes

2. User Engagement Strategies

- 2.1 Gamification and reward systems to encourage participation
- 2.2 User-generated content to foster community involvement
- 2.3 Social media integration for broader outreach

3. Content Authenticity vs. Technological Scalability

- 3.1 Opera experts emphasized maintaining historical and cultural accuracy
- 3.2 Digital developers focused on scalability and AI-driven moderation for content management

4. Sustainability and Institutional Partnerships

- 4.1 Cultural conservationists stressed the importance of long-term sustainability
- 4.2 Institutional collaborations with museums and universities for cultural preservation

5. Platform Usability

- 5.1 Key evaluation criteria: content authenticity, user retention, and cultural impact
- 5.2 Usability concerns: mobile accessibility, intuitive UI/UX design, and data security

These insights formed a strong foundation for the development of a sustainable and effective digital platform for Puju Opera preservation.

4.1.4 Results Comparative Analysis of the Triangulated Findings on the Essential Components of a Participatory Digital Platform for the Preservation of Puju Opera in Shanxi, China

The study examined three perspectives—(1) Audience Opinions (Topic 4.1.1), (2) Shanxi Community Members' In-Depth Interviews (Topic 4.1.2), and (3) Expert Opinions (Topic 4.1.3)—on the key components necessary for developing a participatory digital platform dedicated to the preservation of Puju Opera in Shanxi, China. Below is an analysis of the similarities, differences, and notable insights derived from these three sources.

1) Similarities Across the Three Perspectives

- 1.1) The Need for a Digital Archive and Multimedia Integration

1.1.1) All three groups strongly supported the inclusion of a comprehensive digital archive that stores Puju Opera's history, performances, and related materials.

1.1.2) Experts emphasized accuracy and authenticity, suggesting AI-powered metadata tagging and expert-verified sources.

1.1.3) Gen X valued a historical database, while Gen Y and Gen Z preferred multimedia content such as videos, animations, and interactive storytelling.

1.2) Importance of User Engagement and Gamification

1.2.1) All groups acknowledged that the platform should promote active participation through social media integration, user-generated content, and gamification.

1.2.2) Gen Z and Gen Y prioritized social media challenges (TikTok, Instagram Reels) and gamified learning tools to boost engagement.

1.2.3) Experts agreed on the necessity of gamification but recommended AI-driven personalization for optimized user interaction.

1.3) Ensuring Accessibility and Usability

1.3.1) Community members, audience respondents, and experts emphasized the need for a user-friendly interface with mobile compatibility, multi-language support, and clear navigation.

1.3.2) Gen X focused on detailed guides and tutorials, while Gen Z stressed mobile responsiveness and instant content accessibility.

1.4) The Role of Digital Platforms in Cultural Transmission

1.4.1) All perspectives agreed that the platform should act as an educational hub.

1.4.2) Gen X preferred video lectures and expert interviews.

1.4.3) Gen Y suggested VR/AR immersive learning experiences.

1.4.4) Gen Z favored bite-sized educational content and influencer-led discussions.

2) Differences in Perception Between the Three Perspectives

2.1) Content Authenticity vs. Engagement

2.1.1) Puju Opera Experts emphasized historical and cultural accuracy, advocating expert moderation of user-generated content.

2.1.2) Digital platform developers and Gen Z users prioritized scalability and real-time participation, promoting open contributions and AI-driven curation.

2.2) Preservation vs. Popularization

2.2.1) Gen X focused on sustaining traditional values, favoring expert-led educational efforts.

2.2.2) Gen Y and Gen Z leaned toward modern adaptation, promoting short-form content, gamification, and influencer marketing.

2.3) Sustainability and Institutional Support

2.3.1) Cultural conservationists and experts stressed long-term institutional partnerships (e.g., collaborations with museums and academic institutions) for sustainable funding and knowledge preservation.

2.3.2) Gen Z respondents were less concerned with long-term sustainability but highlighted the need for trendy, viral content to maintain public interest.

2.4) Privacy and Data Protection

2.4.1) Gen X and experts prioritized data security, copyright laws, and content ownership.

2.4.2) Gen Z users were more open to sharing content but wanted flexible opt-in privacy settings.

3) Key Implications and Recommendations

Based on the convergence and divergence of these three perspectives, the following recommendations can be drawn to balance authenticity, engagement, and usability in designing an effective participatory digital platform for Puju Opera preservation:

3.1) Develop a multi-functional digital archive that merges historical accuracy (Gen X, experts) with interactive engagement (Gen Y, Gen Z).

3.2) Integrate user-generated content and social media engagement while ensuring expert moderation to maintain cultural integrity.

3.3) Use AI-powered recommendations and gamification to personalize user experiences and encourage participation.

3.4) Ensure accessibility across generations with mobile-first design (Gen Z), expert-led learning materials (Gen X), and VR-enhanced storytelling (Gen Y).

3.5) Establish long-term sustainability mechanisms by securing institutional partnerships (experts, Gen X) and leveraging monetization strategies through digital engagement tools (Gen Z, Gen Y).

Conclusion, the triangulated findings underscore the necessity of a balanced approach in developing a participatory digital platform for Puju Opera preservation. While experts and Gen X emphasize content authenticity, Gen Y and Gen Z prioritize accessibility, gamification, and social engagement. A well-structured hybrid model that integrates educational rigor, multimedia content, AI-driven engagement, and long-term sustainability mechanisms is key to ensuring that Puju Opera remains culturally relevant and widely accessible for future generations.

Summary, Gen X, Gen Y, Gen Z, and expert participants all agreed on five key components for a participatory digital platform: a comprehensive and accurate digital archive, user engagement through social media and gamification, accessible and user-friendly design, institutional partnerships for long-term sustainability, and strong data security. While generational preferences varied—Gen Z favored short-form content and interactivity, whereas Gen X emphasized structure and accuracy—there was clear alignment on the platform’s core functions. These insights support a hybrid model that balances cultural authenticity with digital engagement.

4.2 Outcome of develop a participatory digital platform model for the preservation of Puju opera in Shan Xi, China

4.2.1 The participatory digital platform model for the preservation of Puju opera in Shan Xi, China

Through document analysis, group surveys, and in-depth interviews with experts, the researcher synthesized the findings to develop a new body of knowledge. This served as a guideline for revitalizing and preserving Puju Opera, a traditional performing art, enabling it to adapt to societal trends, technological advancements,

and audience demands while remaining relevant. The resulting framework, Participatory Digital Platform Model for the Preservation of Puju Opera (PDPM-Puju), consisted of 5 key components:

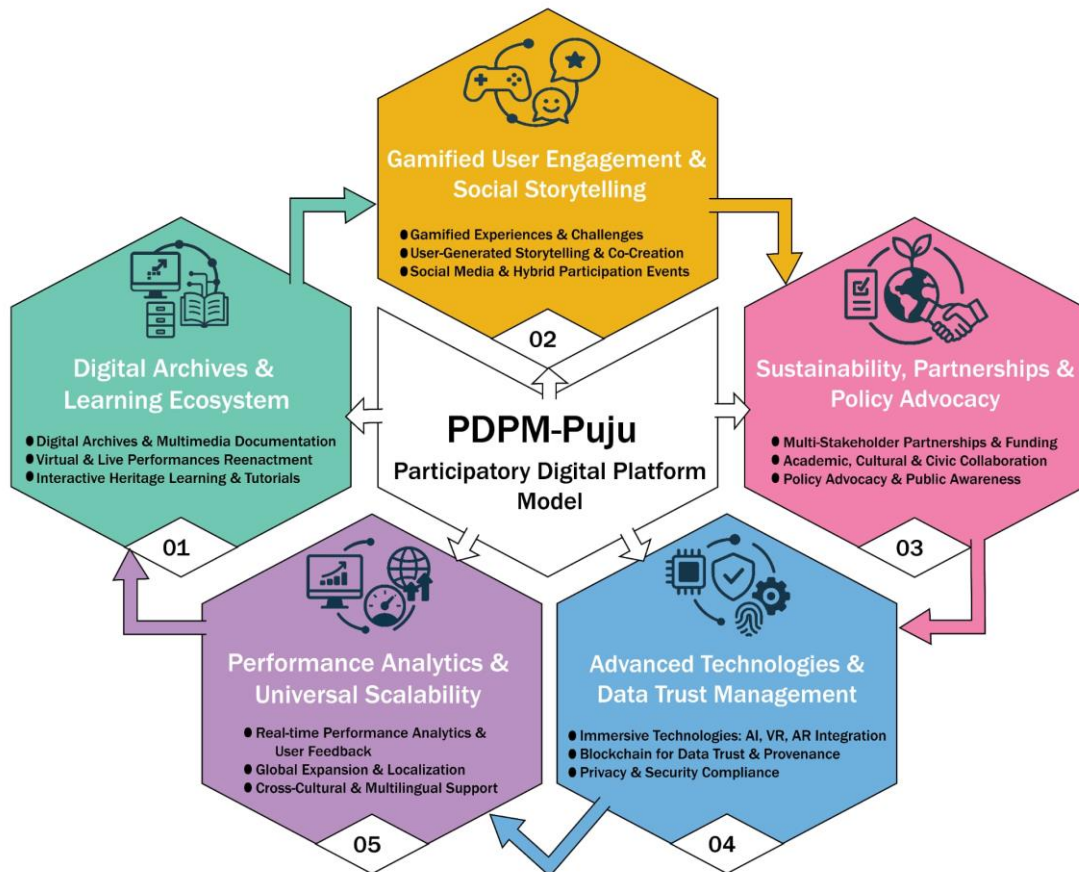


Figure 4. 1 Participatory Digital Platform Model for Puju Opera (PDPM-Puju)

The final model comprises 5 interdependent components that collectively support inclusive and technology-enhanced heritage preservation:

1. Digital Archives & Learning Ecosystem
 - 1.1 Digital Archives & Multimedia Documentation
 - 1.2 Virtual & Live Performances Reenactment
 - 1.3 Interactive Heritage Learning & Tutorials
2. Gamified User Engagement & Social Storytelling
 - 2.1 Gamified Experiences & Challenges
 - 2.2 User-Generated Storytelling & Co-Creation
 - 2.3 Social Media & Hybrid Participation Events

3. Sustainability, Partnerships & Policy Advocacy
 - 3.1 Multi-Stakeholder Partnerships & Funding
 - 3.2 Academic, Cultural & Civic Collaboration
 - 3.3 Policy Advocacy & Public Awareness
4. Advanced Technologies & Data Trust Management
 - 4.1 Immersive Technologies: AI, VR, AR Integration
 - 4.2 Blockchain for Data Trust & Provenance
 - 4.3 Privacy & Security Compliance
5. Performance Analytics & Universal Scalability
 - 5.1 Real-time Performance Analytics & User Feedback
 - 5.2 Global Expansion & Localization
 - 5.3 Cross-Cultural & Multilingual Support

Conclusion, this model blends technology, cultural engagement, and sustainability to create a globally relevant digital ecosystem for Puju Opera preservation. It sets a new standard for digital cultural heritage initiatives and can be adapted for other traditional art forms worldwide.

4.2.2 Appropriateness for the Participatory Digital Platform Model

After developing the Participatory Digital Platform Model for the Preservation of Puju Opera in Shanxi, China, the researcher presented the model to the same group of nine experts for evaluation. The experts assessed its suitability and endorsed it as a valuable framework that could effectively guide the preservation of Puju Opera in Shanxi. The research findings revealed that:

Table 4. 9 Basic information of experts

Name	Basic information	Frequency	Percent
1. Gender:	Female	3	33
	Male	6	67
Total		9	100
2. Age:	30-35	1	11
	36-41	1	11

Name	Basic information	Frequency	Percent
	42-47	2	22
	48-53	2	22
	54-59	2	22
	Over 60	1	11
Total		9	100
3. Educational Level:	Below bachelor's degree	1	11
	Bachelor's Degree	1	11
	Master's Degree	5	56
	Doctoral Degree	2	22
Total		9	100
4. Occupation:	Puju Opera Expert	5	56
	Digital Platform Developer	1	11
	Cultural Conservationist	1	11
	Digital Communication Specialist	1	11
	Anthropology or Social Science Researcher	1	11
	Total		9
5. Experience in cultural conservation through digital media	No	0	0
	Yes	9	100
Total		9	100

Table 4.9, showed the panel of experts consisted of nine specialists from diverse professional backgrounds, including Puju Opera experts (56%), a digital platform developer (11%), a cultural conservationist (11%), a digital communication specialist (11%), and an anthropology/social science researcher (11%). The gender distribution was 67% male and 33% female. In terms of age, most experts fell within the 42–59 age range (66%), indicating that the panel had considerable experience. Regarding education, 56% held a master’s degree, and 22% held a doctoral degree, signifying strong academic expertise. Importantly, 100% of experts had prior experience in cultural conservation through digital media, ensuring the panel’s

relevance to the research focus.

Table 4. 10 Results of the assessment of the appropriateness of participatory digital platform models

Aspect	Appropriateness of Participatory Digital Platform Model Items	Appropriateness level		Meaning
		n=9		
		Mean	S.D.	
1	Digital Archives & Learning Ecosystem			
	1.1 Digital Archives & Multimedia Documentation	4.78	0.44	Strongly Agree
	1.2 Virtual & Live Performances Reenactment	4.78	0.44	Strongly Agree
	1.3 Interactive Heritage Learning & Tutorials	4.78	0.44	Strongly Agree
	Total	4.78	0.42	Strongly Agree
2	Gamified User Engagement & Social Storytelling			
	2.1 Gamified Experiences & Challenges	5.00	0.00	Strongly Agree
	2.2 User-Generated Storytelling & Co-Creation	5.00	0.00	Strongly Agree
	Total	5.00	0.00	Strongly Agree
3	Sustainability, Partnerships & Policy Advocacy			
	3.1 Multi-Stakeholder Partnerships & Funding	5.00	0.00	Strongly Agree
	3.2 Academic, Cultural & Civic Collaboration	5.00	0.00	Strongly Agree
	3.3 Policy Advocacy & Public Awareness	5.00	0.00	Strongly Agree
	Total	5.00	0.00	Strongly Agree
4	Advanced Technologies & Data Trust			

Aspect	Appropriateness of Participatory Digital Platform Model Items	Appropriateness level		Meaning
		n=9		
		Mean	S.D.	
Management				
	4.1 Immersive Technologies: AI, VR, AR Integration	4.78	0.44	Strongly Agree
	4.2 Blockchain for Data Trust & Provenance	5.00	0.00	Strongly Agree
	Total	4.89	0.32	Strongly Agree
5 Performance Analytics & Universal Scalability				
	5.1 Real-time Performance Analytics & User Feedback	4.78	0.44	Strongly Agree
	5.2 Global Expansion & Localization	4.78	0.44	Strongly Agree
	Total	4.78	0.43	Strongly Agree
	Overall Total	4.89	0.32	Strongly Agree

Table 4.10, showed assessment of the Appropriateness of the Participatory Digital Platform Model, the evaluation of the participatory digital platform model for Puju Opera preservation was highly favorable, with an overall Mean score of 4.89 (S.D. = 0.32), indicating strong agreement across all aspects. Key Findings from the Expert Evaluation.

1. Digital Archives & Learning Ecosystem (Mean = 4.78, S.D. = 0.44)

- 1.1 Digital Archives & Multimedia Documentation
- 1.2 Virtual & Live Performances Reenactment
- 1.3 Interactive Heritage Learning & Tutorials

2. Gamified User Engagement & Social Storytelling (Mean = 5.00, S.D. = 0.00)

- 2.1 Gamified Experiences & Challenges
- 2.2 User-Generated Storytelling & Co-Creation
- 2.3 Social Media & Hybrid Participation Events

3. Sustainability, Partnerships & Policy Advocacy (Mean = 5.00, S.D. = 0.00)

- 3.1 Multi-Stakeholder Partnerships & Funding
- 3.2 Academic, Cultural & Civic Collaboration
- 3.3 Policy Advocacy & Public Awareness

4. Advanced Technologies & Data Trust Management (Mean = 4.93, S.D. = 0.15)

- 4.1 Immersive Technologies: AI, VR, AR Integration
- 4.2 Blockchain for Data Trust & Provenance
- 4.3 Privacy & Security Compliance

5. Performance Analytics & Universal Scalability (Mean = 4.78, S.D. = 0.44)

- 5.1 Real-time Performance Analytics & User Feedback
- 5.2 Global Expansion & Localization
- 5.3 Cross-Cultural & Multilingual Support

Conclusion, the expert evaluation confirmed that the Participatory Digital Platform Model for Puju Opera Preservation is highly appropriate, with unanimous agreement on user engagement, sustainability, institutional partnerships, and technology integration. The findings highlight the need for a robust digital infrastructure, community-driven participation, strategic collaborations, and advanced security measures. These insights provide a structured framework for successfully developing and implementing a digital platform that ensures the long-term preservation and global promotion of Puju Opera.

The expert validation of the participatory digital platform model confirms its theoretical soundness and practical viability for preserving Puju Opera in Shanxi, China. This endorsement not only strengthens the model's academic credibility but also provides a clear, structured foundation for its practical application in the design and development of digital tools. By outlining essential components such as digital archiving, user engagement, and institutional sustainability, the model offers a comprehensive framework for implementation. Furthermore, its adaptability allows it to be applied to the preservation of other forms of traditional performing arts,

demonstrating cross-disciplinary relevance. Most importantly, expert approval bridges the gap between theory and practice, ensuring that the model is not only conceptually robust but also applicable in real-world cultural conservation efforts.

4.2.3 Results of Developing a Participatory Digital Platform for the Preservation of Puju Opera in Shanxi, China Using the Discovered Model Process

This system is a front-end application based on wechat mini program, focusing on providing efficient and smooth user experience. The system uses wechat mini program cache as the main data storage medium, and uses Tencent Cloud Object storage (COS) to host and read static resources. The overall architecture is designed to simplify the development process and reduce the dependence on back-end servers, while ensuring the security and efficiency of data access. This program is divided into three functional blocks - home page, Puju video, personal center three parts. flowchart outlines the structure and functionalities of a Participatory Digital Platform for Puju Opera, detailing how users can interact with videos, rate content, follow users, and contribute personal videos. The application has the following main components:

1) Key Components & Functionalities

1.1) Classic Pu Opera Section

- 1.1.1) Users can tap to play a classic Pu Opera video.
- 1.1.2) Videos are automatically marked as "Watched" after opening.
- 1.1.3) Users can bookmark/unbookmark videos by long pressing.

1.2) Personal Gallery

- 1.2.1) Users can watch videos, rate them by tapping stars, and like them with a heart icon.
- 1.2.2) Ratings update the average score dynamically.
- 1.2.3) Users can follow other content creators by long pressing their avatars.
- 1.2.4) Videos marked as "Liked" and followed users are stored as Liked Videos and Followed Users lists.
- 1.2.5) Video views increase by one after a complete playback.

1.3) My Videos

Users can create and upload their own Puju Opera-related content in two sections:

1.3.1) Opera Dressing

(1) Users select a Pu Opera costume and upload a personal image.

(2) AI processes the image to generate an opera dressing video.

(3) Two output modes: General mode and Stage mode

1.3.2) Upload Video

(1) Users can directly upload personal videos related to Puju Opera.

2) Outputs & Stored Data

2.1) Classic Pu Opera Video

2.2) Bookmarked Videos

2.3) Followed Users

2.4) Liked Videos

2.5) User Personal Videos

2.6) User Videos (AI-generated opera dressing videos in stage/general mode)

3) Observations & Analysis

3.1) User Engagement Features

3.1.1) The platform encourages interaction through bookmarking, rating, liking, following, and video creation.

3.1.2) AI-generated opera dressing videos allow for a personalized experience.

3.1.3) Video playback counts and dynamic rating adjustments enhance content visibility.

3.2) Content Creation & Contribution

3.2.1) Users can participate by uploading personal videos or using AI-generated dressing videos.

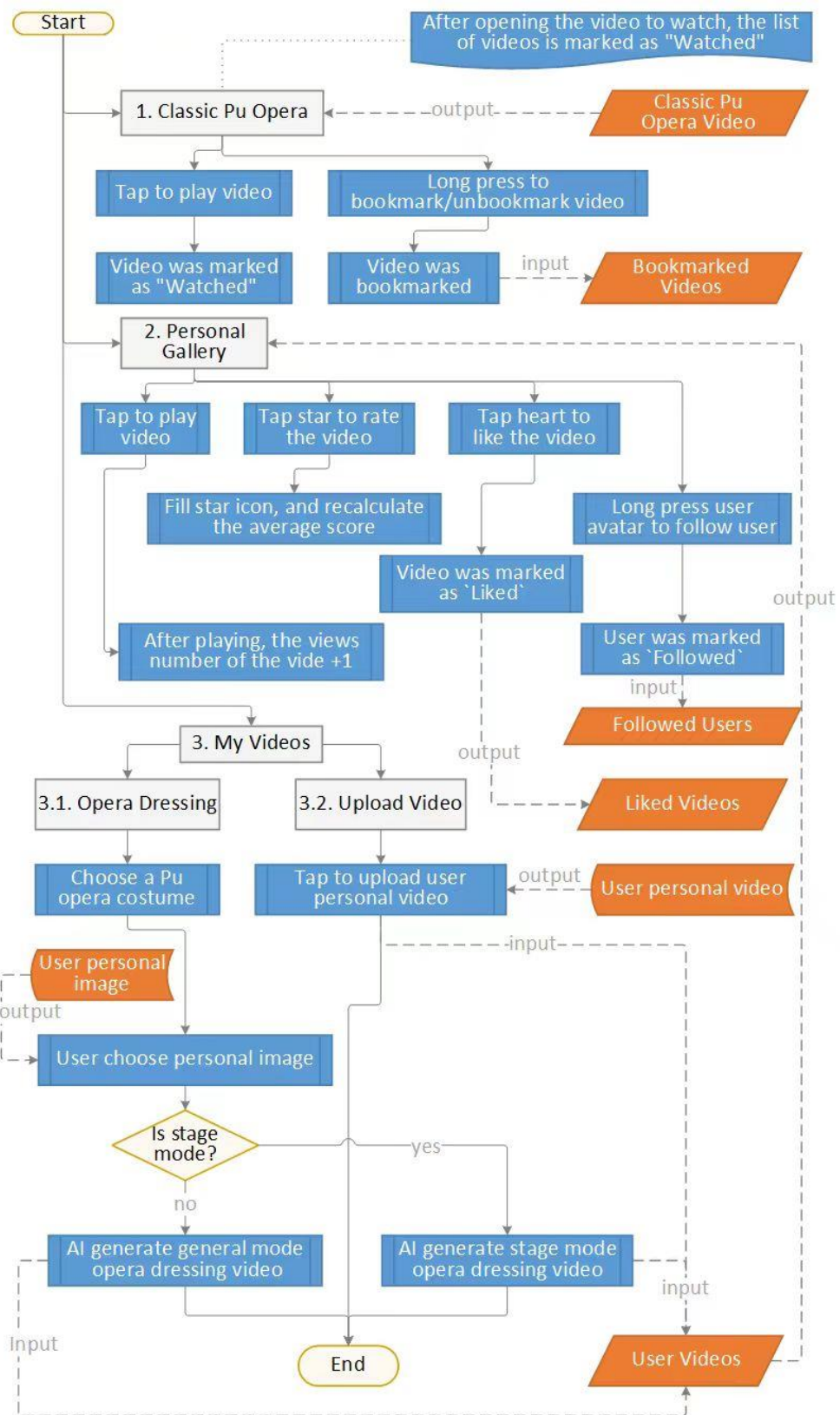


Figure 4. 2 Participatory digital platform for the preservation of Puju opera flowchart

The visualization of the application, which was designed and developed based on the framework of the participatory digital platform model for the preservation of Puju Opera in Shanxi, China, reflected 3 main functional components of the program as follows.

1. Home page



Figure 4. 3 Home page



Figure 4. 4 Introduction to Puju



Figure 4. 5 Puju study

2. Puju opera video

Puju drama video part includes "classic drama", "personal second creation", "shooting video" three functions, the page design is as follows:



Figure 4. 6 Classic drama



Figure 4. 7 Personal two creation scoring function



Figure 4. 8 Shoot a video

3. Personal center

The personal center section contains four parts: "My collection", "My likes", "My learning" and "My concern". The page design is as follows:



Figure 4. 9 Personal center



Figure 4. 10 My favorite



Figure 4. 11 My study



Figure 4. 12 My favorite



Figure 4. 13 Virtual stage



Figure 4. 14 Virtual stage



Figure 4. 15 Virtual stage



Figure 4. 16 Virtual stage



Figure 4. 17 Virtual stage



Figure 4. 18 Virtual stage



Figure 4. 19 Virtual stage



Figure 4. 20 Virtual stage

4.3 Results of the Quality Assessment of the Participatory Digital Platform

After the researcher successfully developed the participatory digital platform as an application compatible with WeChat, it was presented to 9 experts for testing and quality assessment. The evaluation results revealed that

Table 4. 11 Analysis results quality of a participatory digital platform

Aspect	Quality of a participatory digital platform items	Quality level		Meaning
		n=9		
		Mean	S.D.	
1	Components of the Digital Platform for Puju Opera Conservation			
	1.1 The platform provides comprehensive information on the history and culture of Puju Opera.	3.44	0.53	Moderate
	1.2 The content is organized in an easily accessible manner.	3.67	0.50	High
	1.3 The platform includes communication functions to enhance user engagement.	3.78	0.44	High
	1.4 Multimedia presentations make the content more engaging.	4.33	0.50	High
	1.5 The platform is designed to be user-friendly for all audiences.	3.56	0.53	High
	Total	3.76	0.58	High
2	Features and User Engagement			
	2.1 The platform is designed to encourage active participation from users.	4.22	0.44	High
	2.2 Notification features help to maintain user interest.	3.44	0.53	Moderate
	2.3 Integration with social media increases awareness and engagement.	4.44	0.53	High

Aspect	Quality of a participatory digital platform items	Quality level		Meaning
		n=9		
		Mean	S.D.	
	2.4 Rating or comment systems make users feel more involved.	4.11	0.33	High
	2.5 Interactive functions enhance users' learning experiences.	4.22	0.44	High
	Total	4.09	0.45	High
3	Cultural Preservation of Pujua Opera			
	3.1 The platform promotes the transmission of Pujua Opera culture to younger generations.	4.56	0.53	High
	3.2 The content is accurate and aligned with cultural conservation standards.	4.22	0.44	High
	3.3 Collaboration with cultural conservationists is evident in content development.	4.33	0.50	High
	3.4 The content design adheres to cultural preservation principles.	4.56	0.53	High
	3.5 The platform supports connections with other cultural organizations.	3.78	0.44	High
	Total	4.29	0.58	High
4	Platform Quality Assessment			
	4.1 Ease of platform use.	3.56	0.53	High
	4.2 User satisfaction with the platform.	3.56	0.53	High
	4.3 Effectiveness in promoting cultural preservation.	4.11	0.33	High
	4.4 Appropriateness of content and multimedia.	3.67	0.50	High
	4.5 The platform's responsiveness to user participation.	4.33	0.50	High
	Total	3.84	0.52	High

Aspect	Quality of a participatory digital platform items	Quality level		Meaning
		n=9		
		Mean	S.D.	
5	Platform Usability			
	5.1 The platform provides clear user guidance.	3.67	0.50	High
	5.2 Users can easily access information.	3.56	0.53	High
	5.3 Privacy policies are strictly adhered to.	4.22	0.44	High
	5.4 The platform supports learning about Puju Opera.	4.56	0.53	High
	5.5 Technical support is available for users.	3.78	0.44	High
	Total	3.96	0.56	High
	Overall Total	3.99	0.59	High

Table 4.11, showed the quality assessment of the Participatory Digital Platform for the Preservation of Puju Opera involved evaluations from nine experts, focusing on five key aspects: Platform Components, User Engagement, Cultural Preservation, Platform Quality, and Usability. The overall mean score was 3.99 (S.D. = 0.59), indicating a high level of quality.

1. Cultural Preservation of Puju Opera (Mean = 4.29, S.D. = 0.58)

The highest-rated aspect, showing strong agreement on the platform's role in preserving Puju Opera for future generations.

1.1) Promoting cultural transmission (Mean = 4.56, S.D. =0.53)

1.2) Adherence to conservation principles (Mean = 4.56, S.D. =0.53)

1.3) Collaboration with cultural institutions (Mean = 4.33, S.D. =0.50)

2. User Engagement & Features (Mean = 4.09, S.D. = 0.45)

2.1) Engagement strategies were highly effective, particularly through social media

integration (Mean = 4.44, S.D. =0.44) and interactive learning (Mean = 4.22, S.D. =0.44).

2.2) Areas for improvement: Notification systems had the lowest engagement (Mean = 3.44, S.D. =0.53, Moderate).

3. Platform Usability (Mean = 3.96, S.D. = 0.56)

3.1) The platform was considered effective for learning Pujū Opera (Mean = 4.56, S.D. =0.53), and privacy policies were well implemented (Mean = 4.22, S.D. =0.44).

3.2) Navigation and access were slightly lower but still rated high (Mean = 3.56, S.D. =0.53 – Mean=3.67, S.D. =0.50).

4. Platform Quality Assessment (Mean = 3.84, S.D. = 0.52)

4.1) The platform's responsiveness to user participation (Mean = 4.33, S.D. =0.50) and cultural promotion effectiveness (Mean = 4.11, S.D. =0.33) were strengths.

4.2) Ease of use and user satisfaction received the lowest scores (Mean = 3.56, S.D. =0.53), suggesting potential areas for usability enhancements.

5. Digital Platform Components (Mean = 3.76, S.D. = 0.58)

5.1) Multimedia elements made content engaging (Mean = 4.33, S.D. =0.50).

5.2) User-friendliness and accessibility scored high (Mean = 3.56 - 3.78), but historical/cultural content presentation was rated slightly lower (Mean = 3.44, S.D. = 0.53, Moderate).

Conclusions and Relationships Between Findings

1. The platform was highly effective in preserving Pujū Opera, particularly in cultural transmission and content authenticity.

2. User engagement strategies, especially social media integration and interactive learning, were key strengths.

3. Privacy, security, and accessibility were well addressed, increasing trust and usability.

4. Usability and satisfaction levels, while rated high, had the lowest scores, indicating room for UX/UI improvements.

5. The platform's success depended on strong institutional partnerships and continuous content enhancement to sustain long-term cultural preservation.

A well-designed participatory digital platform—featuring accurate content, engaging presentation, and a seamless user experience—can significantly enhance audience perception of Pujū Opera. Through high-quality multimedia such as video, audio, and 3D simulations, viewers better understand the opera's historical and cultural

context. Moreover, interactive features like commenting, storytelling, and gamified participation foster a sense of connection and involvement, transforming passive spectators into active cultural participants. This shift from mere observation to meaningful engagement suggests that a high-quality digital platform does more than inform—it cultivates emotional resonance and sustained appreciation for local intangible heritage.

4.4 Results of evaluating the perception of audiences towards Puju Opera on a participatory digital platform

When the researcher launched the application, developed based on the conceptual framework of the model, on WeChat for audience trial use in an online format, a total of 413 WeChat account members voluntarily participated in using the application. After the trial, the users evaluated their own perceptions. The research findings were presented separately for three generational groups. The researcher reported the study results as follows.

Table 4. 12 Basic information of the Gen X

Items	Option	Frequency	Percent
1.Gender:	Female	53	36
	Male	69	47
	Other	26	18
	Total	148	100
2.Age:	45-49	75	51
	50-54	20	14
	55-60	53	36
	Total	148	100
3.Educational Level:	Graduate	37	25
	High School	43	29
	Undergraduate	38	26
	Other	30	20
	Total	148	100
4.Occupation:	Student	46	31
	Working	71	48
	Professional	31	21
	Other	31	21
	Total	148	100

Table 4.12, showed basic Information of Gen X Respondents, among the 148 Gen X respondents, males constituted the largest proportion (47%), followed by females (36%), and other gender identities (18%). The largest age group belonged to the 45-49 age range (51%), while those aged 55-60 (36%) and 50-54 (14%) represented the remaining respondents. In terms of educational background, the highest percentage held a high school diploma (29%), followed by undergraduate degrees (26%), graduate degrees (25%), and other educational levels (20%). Regarding occupations, working professionals formed the largest group (48%), while students comprised 31% and 21% belonged to other occupations. These results suggest that the surveyed audience had a balanced demographic distribution, with a predominant presence of working professionals and individuals with at least a high school education.

Table 4. 13 Evaluate Gen X audiences' perceptions of preserving Puju Opera on a participatory digital platform

Section	Audience perceptions of Puju Opera on participatory digital platforms	Perceptions		Meaning
		Level		
		n=148		
		Mean	S.D.	
1	Essential Components of the Digital Platform for Puju Opera Preservation			
	1.1 The platform should provide detailed historical information about Puju Opera.	3.52	0.67	High
	1.2 Learning about Puju Opera through the digital platform has enhanced my understanding of Chinese culture.	3.59	0.49	High
	1.3 This platform demonstrates the importance of conserving Puju Opera.	3.62	0.61	High
	1.4 I feel that Puju Opera is an important cultural element that should be preserved for future generations.	3.8	0.4	High

Section	Audience perceptions of Puju Opera on participatory digital platforms	Perceptions		Meaning
		Level		
		n=148		
		Mean	S.D.	
	1.5 The digital platform has helped expand my knowledge about Puju Opera performances and their history.	3.94	0.5	High
	Total	3.69	0.56	High
2	Features and User Engagement			
	2.1 Engagement through the platform has increased my interest in Puju Opera.	3.68	0.47	High
	2.2 I feel that participating in this platform has deepened my understanding of Puju Opera.	3.81	0.49	High
	2.3 Learning through this digital platform is beneficial for studying local culture.	3.89	0.48	High
	2.4 I believe that engaging with this platform can help build a community of Puju Opera enthusiasts.	4.07	0.45	High
	2.5 This platform has inspired me to learn more about Puju Opera and Chinese culture.	3.74	0.53	High
	Total	3.84	0.5	High
3	Cultural Preservation of Puju Opera			
	3.1 I find this digital platform easy to use and accessible.	3.66	0.48	High
	3.2 I can easily find information about Puju Opera on the platform.	3.83	0.47	High
	3.3 This platform is designed to be user-friendly for all age groups.	3.76	0.43	High
	3.4 I feel that the navigation system on the platform is clear and easy to understand.	3.77	0.68	High
	3.5 I am able to explore the platform's content	3.64	0.56	High

Section	Audience perceptions of Puju Opera on participatory digital platforms	Perceptions		Meaning
		Level		
		n=148		
		Mean	S.D.	
	without any issues.			
	Total	3.73	0.53	High
4	Platform Quality Assessment			
	4.1 I am satisfied with the quality of the content provided on this platform.	3.64	0.48	High
	4.2 The content related to Puju Opera on this platform is engaging and appealing.	3.55	0.5	High
	4.3 I find the platform's features encourage more user interaction.	3.24	0.43	High
	4.4 This platform provides comprehensive information on Puju Opera.	3.26	0.44	High
	4.5 The platform's interactive features make me feel connected to other users.	3.66	0.54	High
	Total	3.47	0.51	High
5	Platform Usage			
	5.1 I believe that conserving Puju Opera through a digital platform is an effective approach.	3.78	0.41	High
	5.2 The digital platform highlights the importance of preserving Puju Opera in today's era.	4.24	0.47	High
	5.3 I feel this platform can promote Puju Opera on an international level.	3.36	0.61	High
	5.4 I believe that preserving Puju Opera in digital form supports sustainable content storage.	4.51	0.5	High
	5.5 I feel that this digital platform will help generate interest among the younger generation in conserving Puju Opera.	4.14	0.71	High

Section	Audience perceptions of Puju Opera on participatory digital platforms	Perceptions		
		Level		Meaning
		n=148		
		Mean	S.D.	
	Total	4.01	0.68	High
	Overall Total	3.75	0.59	High

Table 4.13 showed the overall perception of the participatory digital platform was high (Mean=3.75, S.D.=0.59), indicating positive feedback from Gen X respondents across all aspects.

1. Essential Components of the Digital Platform (Mean = 3.69, S.D. = 0.56)

Respondents highly valued the role of the platform in expanding knowledge about Puju Opera performances and history (Mean=3.94, S.D.=0.50). The belief that Puju Opera is an important cultural heritage that should be preserved (Mean=3.80, S.D.=0.40) also ranked highly. Additionally, respondents acknowledged that learning through the platform enhanced their understanding of Chinese culture (Mean=3.59, S.D.=0.49) and that it provided detailed historical information about Puju Opera (Mean=3.52, S.D.=0.67).

2. Features and User Engagement (Mean = 3.84, S.D. = 0.50)

User engagement levels were also high (Mean=3.84, S.D.=0.50). The strongest perception was that the platform helps build a community of Puju Opera enthusiasts (Mean=4.07, S.D.=0.45), followed by the belief that learning through this platform is beneficial for studying local culture (Mean=3.89, S.D.=0.48). Moreover, the platform deepened users' understanding of Puju Opera (Mean=3.81, S.D.=0.49) and increased interest in Puju Opera (Mean=3.68, S.D.=0.47)**.

3. Cultural Preservation of Puju Opera (Mean = 3.73, S.D. = 0.53)

The platform's effectiveness in providing easy access to Puju Opera-related information (Mean=3.83, S.D.=0.47) and maintaining user-friendliness across all age groups (Mean=3.76, S.D.=0.43) received strong agreement. However, exploration without any issues (Mean=3.64, S.D.=0.56) had a slightly lower but still positive evaluation. The overall score in this section was high (Mean=3.73, S.D.=0.53).

4. Platform Quality Assessment (Mean = 3.47, S.D. = 0.51)

The quality of platform content was positively rated (Mean=3.64, S.D.=0.48), but interactive features encouraging user interaction (Mean=3.24, S.D.=0.43) received the lowest score among all components. Although the platform's ability to provide comprehensive information (Mean=3.26, S.D.=0.44) had a moderate score, it was evident that Gen X respondents prioritized content quality over interactivity. The overall mean in this category was the lowest among all sections (Mean=3.47, S.D.=0.51).

5. Platform Usage (Mean = 4.01, S.D. = 0.68)

Among all evaluation criteria, platform usage received the highest overall mean (Mean=4.01, S.D.=0.68). The strongest agreement was observed in the perception that digital preservation ensures sustainable content storage (Mean=4.51, S.D.=0.50). Respondents also strongly believed that the platform highlights the importance of preserving Puju Opera in today's era (Mean=4.24, S.D.=0.47) and that it encourages younger generations to participate in Puju Opera conservation (Mean=4.14, S.D.=0.71).

Key Findings and Interpretation

1. The most positively perceived aspect was the platform's ability to preserve Puju Opera through digital storage (Mean=4.51, S.D.=0.50), demonstrating a strong belief in the effectiveness of digital archiving.

2. User engagement elements performed well (Mean=3.84, S.D.=0.50), especially in fostering a community of Puju Opera enthusiasts (Mean=4.07, S.D.=0.45).

3. Content quality and platform usability received positive ratings, particularly in the accessibility of historical information (Mean=3.83, S.D.=0.47).

4. The lowest-rated component was interactivity (Mean=3.24, S.D.=0.43), indicating that while the platform effectively delivers content, it needs improvement in enhancing interactive experiences.

5. Overall, the study confirmed that Gen X users recognize the digital platform as an effective tool for Puju Opera preservation, particularly through its educational resources, content quality, and ability to engage users in meaningful cultural experiences.

This analysis provides crucial insights for refining the platform, with a focus on enhancing interactivity, maintaining high content quality, and reinforcing digital conservation strategies.

Table 4. 14 Basic information of the Gen Y

Items	Option	Frequency	Percent
1.Gender:	Female	59	39
	Male	63	42
	Other	29	19
	Total	151	100
2.Age:	29-33	57	38
	34-38	64	42
	39-44	30	20
	Total	151	100
3.Educational Level:	Graduate	49	32
	High School	39	26
	Undergraduate	33	22
	Other	30	20
	Total	151	100
4.Occupation:	Student	46	30
	Working	75	50
	Professional	30	20
	Other	30	20
	Total	151	100

Table 4.14 Basic Information of Gen Y (151 Respondents), the majority of Gen Y respondents were male (42%), followed by females (39%), and other gender identities (19%). In terms of age, the largest group was aged between 34-38 years (42%), followed by those aged 29-33 years (38%), and the smallest group aged 39-44 years (20%). Regarding educational background, graduates made up the largest proportion (32%), followed by high school graduates (26%) and undergraduates (22%), with the remaining 20% falling into other educational categories. In terms of

occupation, half of the respondents were working professionals (50%), while students accounted for 30%, and the remaining 20% identified with other occupations. These demographic characteristics indicate a diverse range of educational and professional backgrounds among respondents, with a notable presence of working professionals and individuals with higher education levels.

Table 4. 15 Evaluate Gen Y audiences' perceptions of preserving Puju Opera on a participatory digital platform

Section	Audience perceptions of Puju Opera on participatory digital platforms	Perceptions		Meaning
		Level		
		n=151		
		Mean	S.D.	
1	Essential Components of the Digital Platform for Puju Opera Preservation			
	1.1 The platform should provide detailed historical information about Puju Opera.	3.56	0.74	High
	1.2 Learning about Puju Opera through the digital platform has enhanced my understanding of Chinese culture.	3.64	0.55	High
	1.3 This platform demonstrates the importance of conserving Puju Opera.	3.72	0.58	High
	1.4 I feel that Puju Opera is an important cultural element that should be preserved for future generations.	3.85	0.36	High
	1.5 The digital platform has helped expand my knowledge about Puju Opera performances and their history.	3.81	0.5	High
	Total	3.72	0.57	High
2	Features and User Engagement			
	2.1 Engagement through the platform has increased my interest in Puju Opera.	3.67	0.47	High

Section	Audience perceptions of Puju Opera on participatory digital platforms	Perceptions		Meaning
		Level		
		n=151		
		Mean	S.D.	
	2.2 I feel that participating in this platform has deepened my understanding of Puju Opera.	3.79	0.49	High
	2.3 Learning through this digital platform is beneficial for studying local culture.	3.87	0.49	High
	2.4 I believe that engaging with this platform can help build a community of Puju Opera enthusiasts.	4.09	0.47	High
	2.5 This platform has inspired me to learn more about Puju Opera and Chinese culture.	3.72	0.53	High
	Total	3.83	0.51	High
3	Cultural Preservation of Puju Opera			
	3.1 I find this digital platform easy to use and accessible.	3.64	0.48	High
	3.2 I can easily find information about Puju Opera on the platform.	3.81	0.48	High
	3.3 This platform is designed to be user-friendly for all age groups.	3.75	0.44	High
	3.4 I feel that the navigation system on the platform is clear and easy to understand.	3.79	0.7	High
	3.5 I am able to explore the platform's content without any issues.	3.63	0.56	High
	Total	3.73	0.54	High
4	Platform Quality Assessment			
	4.1 I am satisfied with the quality of the content provided on this platform.	3.64	0.48	High
	4.2 The content related to Puju Opera on this platform is engaging and appealing.	3.54	0.5	High

Section	Audience perceptions of Puju Opera on participatory digital platforms	Perceptions		Meaning
		Level		
		n=151		
		Mean	S.D.	
4.3	I find the platform's features encourage more user interaction.	3.23	0.42	High
4.4	This platform provides comprehensive information on Puju Opera.	3.26	0.44	High
4.5	The platform's interactive features make me feel connected to other users.	3.65	0.54	High
Total		3.46	0.51	High
5	Platform Usage			
5.1	I believe that conserving Puju Opera through a digital platform is an effective approach.	3.77	0.42	High
5.2	The digital platform highlights the importance of preserving Puju Opera in today's era.	4.23	0.47	High
5.3	I feel this platform can promote Puju Opera on an international level.	3.36	0.6	High
5.4	I believe that preserving Puju Opera in digital form supports sustainable content storage.	4.52	0.5	High
5.5	I feel that this digital platform will help generate interest among the younger generation in conserving Puju Opera.	4.11	0.72	High
Total		4.00	0.68	High
Overall Total		3.75	0.59	High

Table 4.15 perceptions of Gen Y Towards the Digital Platform for Puju Opera, the overall perception of Gen Y towards the participatory digital platform for Puju Opera was positive (Mean=3.75, S.D.=0.59), indicating that respondents generally valued the platform for its role in preserving and promoting Puju Opera.

1. Essential Components of the Digital Platform (Mean=3.72, S.D.=0.57)

Respondents agreed that the platform significantly contributed to their understanding of Pujū Opera and its importance in cultural preservation (Mean=3.72, S.D.=0.57). The highest-rated perception was that Pujū Opera should be preserved for future generations (Mean=3.85, S.D.=0.36), followed by the belief that the platform expanded their knowledge about Pujū Opera performances and history (Mean=3.81, S.D.=0.50).

2. Features and User Engagement (Mean=3.83, S.D.=0.51)

The engagement aspect of the platform received strong positive feedback (Mean=3.83, S.D.=0.51). The most notable finding was that respondents believed engaging with the platform could help build a Pujū Opera enthusiast community (Mean=4.09, S.D.=0.47). Additionally, respondents appreciated learning through the digital platform as beneficial to studying local culture (Mean=3.87, S.D.=0.49).

3. Cultural Preservation of Pujū Opera (Mean=3.73, S.D.=0.54)

The platform's accessibility and ease of use were well received (Mean=3.73, S.D.=0.54). Respondents found that it provided easy access to information about Pujū Opera (Mean=3.81, S.D.=0.48) and featured a clear navigation system (Mean=3.79, S.D.=0.70).

4. Platform Quality Assessment (Mean=3.46, S.D.=0.51)

While respondents expressed satisfaction with the quality of content (Mean=3.64, S.D.=0.48), the overall perception of platform quality was slightly lower (Mean=3.46, S.D.=0.51). The platform's ability to encourage user interaction (Mean=3.23, S.D.=0.42) and provide comprehensive information on Pujū Opera (Mean=3.26, S.D.=0.44) were areas identified for potential improvement.

4. Platform Usage (Mean=4.00, S.D.=0.68)

Respondents showed strong support for digital preservation as an effective approach (Mean=4.00, S.D.=0.68). The highest-rated perception was that preserving Pujū Opera in digital form supports sustainable content storage (Mean=4.52, S.D.=0.50), followed by the belief that the digital platform effectively highlights the importance of preserving Pujū Opera in today's era (Mean=4.23, S.D.=0.47). Additionally, respondents agreed that the platform could generate interest among the younger generation in conserving Pujū Opera (Mean=4.11, S.D.=0.72).

Key Takeaways and Implications

1. Strong Cultural and Educational Impact: Gen Y respondents acknowledged the platform's role in educating users about Puju Opera and raising awareness about its historical significance.

2. High Engagement Potential: Features fostering user interaction and engagement were well received, especially in terms of community-building and increasing cultural appreciation.

3. Areas for Improvement in Content Presentation: While respondents valued the content, they suggested improvements in platform interactivity and comprehensiveness.

4. Significant Role in Long-Term Preservation: Digital preservation was perceived as an effective and sustainable approach, highlighting the importance of maintaining high-quality digital archives and interactive features.

These insights suggest that enhancing the platform's interactive features and ensuring high-quality content presentation will be key to maximizing user engagement and long-term cultural impact.

Table 4. 16 Basic information of the Gen Z

Items	Option	Frequency	Percent
1. Gender	Female	44	39
	Male	38	33
	Other	32	28
	Total	114	100
2. Age	13-17	64	56
	18-22	27	24
	23-28	23	20
	Total	114	100
3. Educational Level	Graduate	15	13
	High School	32	28
	Undergraduate	42	37
	Other	25	22
	Total	114	100
4. Occupation	Student	47	41
	Working Professional	33	29
	Other	34	30
	Total	114	100

Table 4.16 Showed the Gen Z sample (n = 114) demonstrated notable diversity. Gender distribution showed 39% female, 33% male, and 28% identifying as other genders. In terms of age, most respondents (56%) were between 13–17 years old, followed by 24% aged 18–22 years and 20% aged 23–28 years. Educationally, 37% were undergraduates, 28% had completed high school, 13% held graduate degrees, and 22% fell into other categories. Regarding occupation, 41% were students, 29% working professionals, and 30% others. These findings highlight the importance of designing participatory digital platforms that are youth-oriented, inclusive, and adaptable to diverse educational and occupational backgrounds.

Table 4. 17 Evaluate Gen Z audiences' perceptions of preserving Puju Opera on a participatory digital platform.

Section	Audience perceptions of Puju Opera on participatory digital platforms	Perceptions		Meaning
		Level		
		Mean	S.D.	
1	Essential Components of the Digital Platform for Puju Opera Preservation			
	1.1 The platform should provide detailed historical information about Puju Opera.	3.84	0.86	High
	1.2 Learning about Puju Opera through the digital platform has enhanced my understanding of Chinese culture.	3.92	0.55	High
	1.3 This platform demonstrates the importance of conserving Puju Opera.	4.03	0.56	High
	1.4 I feel that Puju Opera is an important cultural element that should be preserved for future generations.	4.07	0.26	High
	1.5 The digital platform has helped expand my knowledge about Puju Opera performances and their history.	4.06	0.28	High

Section	Audience perceptions of Puju Opera on participatory digital platforms	Perceptions		Meaning
		Level		
		n=114		
		Mean	S.D.	
	Total	3.98	0.55	High
2	Features and User Engagement			
	2.1 Engagement through the platform has increased my interest in Puju Opera.	3.96	0.44	High
	2.2 I feel that participating in this platform has deepened my understanding of Puju Opera.	4.03	0.36	High
	2.3 Learning through this digital platform is beneficial for studying local culture.	4.08	0.27	High
	2.4 I believe that engaging with this platform can help build a community of Puju Opera enthusiasts.	4.07	0.29	High
	2.5 This platform has inspired me to learn more about Puju Opera and Chinese culture.	3.93	0.47	High
	Total	4.01	0.38	High
3	Cultural Preservation of Puju Opera			
	3.1 I find this digital platform easy to use and accessible.	3.96	0.51	High
	3.2 I can easily find information about Puju Opera on the platform.	4.09	0.37	High
	3.3 This platform is designed to be user-friendly for all age groups.	4.11	0.34	High
	3.4 I feel that the navigation system on the platform is clear and easy to understand.	3.74	0.65	High
	3.5 I am able to explore the platform's content without any issues.	3.84	0.6	High
	Total	3.95	0.53	High
4	Platform Quality Assessment			

Section	Audience perceptions of Puju Opera on participatory digital platforms	Perceptions		Meaning
		Level		
		n=114		
		Mean	S.D.	
	4.1 I am satisfied with the quality of the content provided on this platform.	3.76	0.6	High
	4.2 The content related to Puju Opera on this platform is engaging and appealing.	3.8	0.58	High
	4.3 I find the platform's features encourage more user interaction.	3.64	0.64	High
	4.4 This platform provides comprehensive information on Puju Opera.	3.63	0.81	High
	4.5 The platform's interactive features make me feel connected to other users.	3.95	0.56	High
	Total	3.76	0.65	High
5	Platform Usage			
	5.1 I believe that conserving Puju Opera through a digital platform is an effective approach.	4.17	0.37	High
	5.2 The digital platform highlights the importance of preserving Puju Opera in today's era.	4.31	0.46	High
	5.3 I feel this platform can promote Puju Opera on an international level.	4.08	0.27	High
	5.4 I believe that preserving Puju Opera in digital form supports sustainable content storage.	4.37	0.48	High
	5.5 I feel that this digital platform will help generate interest among the younger generation in conserving Puju Opera.	4.43	0.5	High
	Total	4.27	0.44	High
	Overall Total	3.99	0.54	High

Table 4.17 evaluation of Gen Z's Perception of the Participatory Digital Platform for Puju Opera (n=114), overall, Gen Z had a high level of positive perception towards the participatory digital platform for Puju Opera (Mean=3.99, S.D.=0.54). The evaluation was divided into five key aspects:

1. Essential Components of the Digital Platform (Mean=3.98, S.D.=0.55)

Respondents highly valued the platform's role in preserving Puju Opera, particularly its ability to provide historical information (Mean=3.84, S.D.=0.86) and expand knowledge on Puju Opera performances (Mean=4.06, S.D.=0.28). The highest-rated statement emphasized the importance of conserving Puju Opera for future generations (Mean=4.07, S.D.=0.26), demonstrating that Gen Z acknowledges the cultural significance of this art form.

2. Features and User Engagement (Mean=4.01, S.D.=0.38)

Gen Z respondents expressed that engaging with the platform deepened their understanding of Puju Opera (Mean=4.03, S.D.=0.36) and that learning through this platform was beneficial for studying local culture (Mean=4.08, S.D.=0.27). The idea that the platform could help build a community of Puju Opera enthusiasts also received strong agreement (Mean=4.07, S.D.=0.29). These results highlight the effectiveness of participatory and interactive features in fostering cultural interest.

3. Cultural Preservation of Puju Opera (Mean=3.95, S.D.=0.53)

The ease of accessing information (Mean=4.09, S.D.=0.37) and the platform's user-friendly design for all age groups (Mean=4.11, S.D.=0.34) were well-received. However, navigation clarity had a relatively lower score (Mean=3.74, S.D.=0.65), suggesting potential areas for improvement in user experience.

4. Platform Quality Assessment (Mean=3.76, S.D.=0.65)

The overall content quality received positive feedback (Mean=3.76, S.D.=0.60), while interactive features that encourage user engagement received a slightly lower score (Mean=3.64, S.D.=0.64). This suggests that while the platform provides valuable content, enhancing interactivity could further improve user experience.

5. Platform Usage (Mean=4.27, S.D.=0.44)

This section received the highest overall rating (Mean=4.27, S.D.=0.44), indicating strong support for using digital platforms to preserve Puju Opera. The most

highly rated perception was that the platform could generate interest among younger generations (Mean=4.43, S.D.=0.50). The ability of the platform to support sustainable content storage (Mean=4.37, S.D.=0.48) and highlight the importance of preserving Puju Opera in the modern era (Mean=4.31, S.D.=0.46) were also widely recognized.

Key Findings and Interpretations

1. **Strong Cultural Awareness:** Gen Z respondents recognized the importance of preserving Puju Opera, as seen in their high ratings for historical knowledge and long-term conservation.

Engagement and Learning Impact: The platform successfully enhanced cultural understanding, particularly through participatory features and digital learning tools.

2. **Ease of Access and Usability:** While the platform was considered user-friendly, some concerns about navigation clarity were noted.

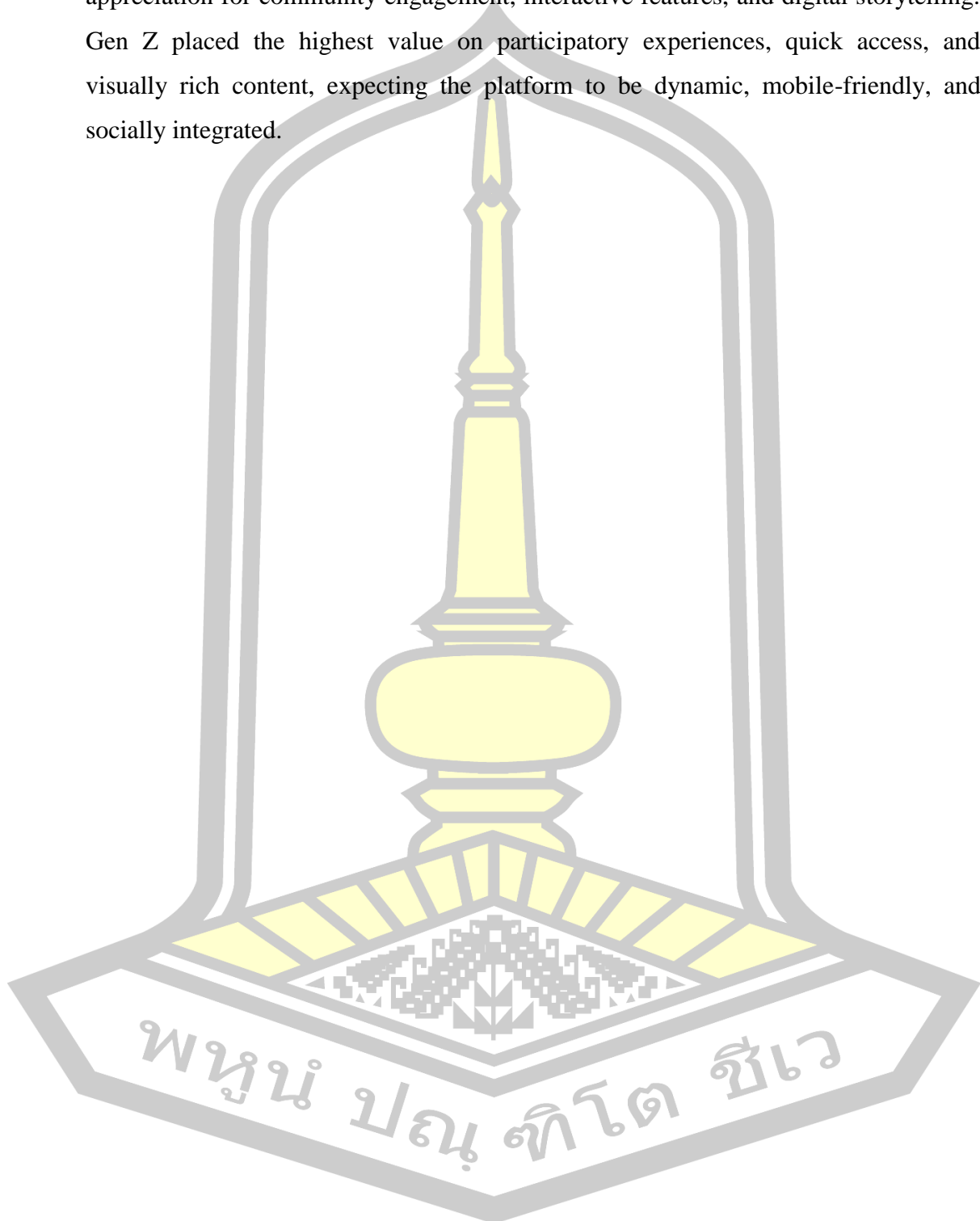
3. **Quality and Interactivity:** The platform's content was well-received, but improving interactive features could further increase user participation.

4. **Sustainability and Influence on Younger Generations:** The platform was seen as an effective tool for making Puju Opera relevant to modern audiences, ensuring its long-term preservation.

Overall, the findings suggest that a participatory digital platform has strong potential for engaging younger generations in cultural conservation, with room for improvement in interactivity and navigation features.

Summary, the perceptions of Gen X, Gen Y, and Gen Z toward the participatory digital platform for Puju Opera preservation reveal both notable similarities and generational differences that shape the future trajectory of cultural conservation in the digital space. Across all three groups, there was shared recognition of Puju Opera's cultural significance and the platform's value in promoting historical awareness and ensuring long-term preservation. All generations appreciated the platform's educational function and supported its role in sustaining interest in traditional arts. However, differences emerged in expectations regarding content delivery and interaction. Gen X emphasized content accuracy, structured learning, and ease of use, favoring a platform that provides reliable information with minimal

complexity. In contrast, Gen Y balanced a desire for accurate content with a strong appreciation for community engagement, interactive features, and digital storytelling. Gen Z placed the highest value on participatory experiences, quick access, and visually rich content, expecting the platform to be dynamic, mobile-friendly, and socially integrated.



CHAPTER 5

Conclusion, Discussion, and Suggestions

This chapter presents conclusion, discussion, and suggestions derived from the study on Developing a participatory digital platform model for the preservation of Puju opera in Shan Xi, China. The researcher highlights four major aspects as follows.

5.1 Conclusion

5.1.1 Factors Influencing the Identification of Essential Components for a Participatory Digital Platform for Puju Opera Preservation

The study revealed that the identification of essential components for developing a participatory digital platform for Puju Opera preservation was influenced by a combination of cultural, technological, generational, and institutional factors. Cultural relevance and the need to safeguard intangible heritage emerged as primary drivers, with stakeholders emphasizing the importance of maintaining the authenticity of traditional performance practices while adapting them to digital environments. The technological context—particularly the availability of immersive tools such as AI, VR, and AR—played a critical role in shaping how content could be archived, presented, and interacted with in meaningful ways.

Generational differences further influenced component prioritization. Gen X valued historical integrity, comprehensive documentation, and expert-led content curation. In contrast, Gen Y and Gen Z placed higher importance on interactivity, gamification, and accessibility through mobile and social media platforms. These generational preferences helped define the balance between preservation and user engagement in the platform's design.

Institutional factors, such as partnerships with universities, museums, and cultural agencies, also shaped component selection by ensuring long-term sustainability, funding, and professional oversight. Additionally, expert feedback underscored the need for inclusive participation mechanisms that empower communities to contribute content, ensuring the platform reflects diverse voices and lived experiences.

Collectively, these factors informed a multidimensional framework for determining essential platform components that not only preserve the artistic and historical value of Puju Opera but also promote active, inclusive, and sustainable cultural engagement in the digital age.

5.1.2 The Essential Components of Participatory Digital Platforms for Preserving Shanxi's Puju Opera

The research identified five essential components that are critical to the success of a participatory digital platform for preserving Puju Opera. First, a comprehensive digital archive is vital for storing historical records, scripts, visual media, and oral histories, ensuring that both tangible and intangible elements of the tradition are systematically preserved—particularly valued by Gen X, who prioritize authenticity and detailed documentation. Second, interactive features such as user-generated content, gamification, and virtual learning environments are necessary to promote active engagement and cultural transmission, particularly among Gen Y and Gen Z, who seek dynamic and personalized digital experiences. Third, integration with social media and hybrid communication channels helps expand audience reach and foster a sense of community participation, aligning closely with the digital habits of Gen Z. Fourth, long-term sustainability relies on institutional partnerships, including collaborations with universities, museums, and cultural organizations, which provide expertise, resources, and policy support—an aspect especially emphasized by Gen X and cultural experts. Lastly, robust technological infrastructure—incorporating AI, AR/VR, and blockchain for data integrity—ensures secure, accessible, and immersive experiences for all generational groups. Together, these components form the foundation of a participatory platform that not only preserves Puju Opera but also revitalizes its relevance for contemporary and future audiences.

5.1.3 The Participatory Digital Platform Model for Puju Opera Preservation in Shanxi, China

The proposed model for a participatory digital platform to preserve Puju Opera in Shanxi is built upon an integration of cultural authenticity, technological

innovation, and community engagement. It is designed as a multi-functional system that combines archival preservation, interactive learning, and user participation within a unified digital environment. The model includes features such as a structured digital archive, which responds to the preferences of Gen X, who emphasize historical accuracy and comprehensive documentation. It also incorporates immersive technologies for performance simulation and community-contributed content, aligning with the engagement styles of Gen Y and Gen Z, who value interactive and co-creative digital experiences. Social media integration and gamified elements are included to attract Gen Z, who prefer mobile accessibility and peer-based sharing. The platform supports diverse educational modules and is accessible across devices to meet the needs of all generational groups. Importantly, the model is grounded in institutional collaboration to ensure long-term sustainability and cultural legitimacy—an aspect especially relevant to Gen X and expert stakeholders. The participatory dimension empowers users not only as audiences but as contributors, reinforcing the continuity of Puju Opera through active cultural involvement. This model serves as a blueprint for preserving endangered performing arts while adapting to the expectations of contemporary digital ecosystems.

5.1.4 Appropriateness of a Participatory Digital Platform Model for the Preservation of Puju Opera in Shanxi, China

The research confirmed that the proposed participatory digital platform model is highly appropriate for the preservation of Puju Opera, based on expert evaluations across multiple dimensions. The model aligns well with the goals of cultural preservation, technological innovation, and community participation. Experts acknowledged its ability to integrate archival depth—particularly appreciated by Gen X, who value historical integrity—with interactive features that meaningfully engage users from Gen Y and Gen Z, who prefer dynamic, participatory, and socially connected experiences. The inclusion of immersive technologies, user-generated content, and academic partnerships ensures both cultural authenticity and practical usability. Additionally, the model was found to be flexible and scalable, making it suitable for adaptation to other forms of traditional performing arts. Overall, the model was recognized as a well-balanced and context-sensitive solution that

effectively bridges heritage conservation with contemporary digital engagement across generations.

5.1.5 The Quality of a Participatory Digital Platform for the Preservation of Puju Opera in Shanxi, China

The study found that the participatory digital platform model demonstrates a high level of quality across key dimensions relevant to cultural heritage preservation. Experts assessed the platform as well-structured, user-centered, and culturally appropriate. The content was regarded as accurate, meaningful, and aligned with the historical and artistic values of Puju Opera—an aspect especially important to Gen X, who prioritize authenticity and tradition. The model's interface and functionality were found to be accessible and intuitive, supporting both expert users and general audiences. Additionally, the integration of interactive features—such as digital archives, immersive learning tools, and spaces for user participation—was seen as particularly effective in engaging Gen Y and Gen Z, who favor interactive, flexible, and socially connected digital environments. Institutional collaboration and technological adaptability further reinforced the platform's long-term usability. Overall, the model was recognized for effectively combining preservation integrity, valued by Gen X, with participatory innovation that resonates with the expectations of Gen Y and Gen Z, ensuring that it meets both technical standards and evolving cultural engagement needs.

5.1.6 The Perception of Audiences Towards Puju Opera on a Participatory Digital Platform

The study found that audience perception of Puju Opera through the participatory digital platform was generally positive and supportive across Gen X, Gen Y, and Gen Z. Users expressed appreciation for how the platform enhanced their understanding of Puju Opera, offering convenient access to historical content and interactive experiences that deepened their cultural connection. Gen Z was particularly responsive to features such as gamified learning, social media integration, and mobile accessibility, which encouraged active engagement and exploration. Gen X valued the authenticity of the content and the structured presentation of historical

narratives, reflecting their interest in tradition and accuracy. Gen Y responded positively to the platform's blend of educational content and digital interactivity, appreciating both convenience and cultural relevance. Across all generational groups, there was shared recognition of the platform's role in preserving tradition while making it accessible and meaningful in a contemporary digital context. The findings indicate that the platform effectively supports both educational and emotional engagement, fostering renewed interest in Puju Opera among diverse users.

5.2 Discussion

5.2.1 Factors Influencing the Identification of Essential Components for a Participatory Digital Platform for Puju Opera Preservation

The identification of essential components for developing a participatory digital platform to preserve Puju Opera is shaped by an intricate interplay of cultural, technological, generational, and institutional factors. Culturally, the imperative to safeguard intangible heritage drives the need to maintain the authenticity of traditional performance practices while adapting them for digital environments, echoing the principles of digital repatriation that ensure cultural continuity through technology (Christen, 2011). Technologically, advancements in Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR) have transformed how content is archived, presented, and interacted with, facilitating more engaging and accessible cultural experiences (Barbash, Petrenko, & Yepyk, 2024). Generational factors further influence design priorities: Generation X (Gen X) tends to prioritize historical integrity and expert-led curation, whereas Generation Y (Gen Y) and Generation Z (Gen Z) emphasize interactivity, gamification, and mobile social engagement, necessitating a platform that balances tradition with digital innovation (Liew & Passau, 2024). Institutionally, partnerships with universities, museums, and cultural organizations ensure sustainability, funding, and professional expertise, while fostering inclusive mechanisms that empower community participation and represent diverse narratives (Buragohain et al., 2024). Together, these factors form a multidimensional framework that not only preserves the artistic and historical value of

Puju Opera but also advances active, inclusive, and sustainable cultural engagement in the digital era.

5.2.2 Essential Components of Participatory Digital Platforms for Preserving Shanxi's Puju Opera

The preservation of Shanxi's Puju Opera through participatory digital platforms necessitates a multifaceted approach that intertwines cultural authenticity, technological innovation, and community engagement. Central to this endeavor is the establishment of comprehensive digital archives that meticulously document scripts, audio-visual materials, and oral histories, ensuring the safeguarding of both tangible and intangible cultural elements (Hutson, 2023). To foster active user engagement, particularly among younger generations, the integration of interactive features such as gamification, virtual simulations, and user-generated content is imperative. These elements have been shown to enhance user immersion and facilitate deeper connections with cultural heritage (Wen & Xue, 2024). Moreover, the incorporation of immersive technologies like augmented and virtual reality offers dynamic and engaging experiences, effectively bridging the gap between traditional art forms and contemporary audiences (Technology Innovators, 2023). Social media platforms play a pivotal role in expanding the reach of Puju Opera, enabling widespread dissemination and fostering a sense of community among enthusiasts. Studies indicate that social media not only aids in the promotion of cultural heritage but also encourages participatory practices that are vital for sustainability (Ahmad et al., 2024). Institutional partnerships with universities, museums, and cultural organizations provide essential support in terms of resources, expertise, and policy guidance, ensuring the platform's long-term viability (Liew & Passau, 2024). Furthermore, the adoption of advanced technologies such as blockchain enhances data security and authenticity, which are critical for maintaining the integrity of cultural records (Barbash et al., 2024). Collectively, these components form a robust framework that not only preserves the rich heritage of Puju Opera but also revitalizes its relevance in the digital age, ensuring its transmission to future generations.

Conclusion, the integration of these components forms a comprehensive framework that not only preserves the artistic and historical value of Puju Opera but

also promotes active, inclusive, and sustainable cultural engagement in the digital age. By aligning traditional cultural preservation methods with modern technological advancements, this participatory digital platform model serves as a blueprint for safeguarding intangible cultural heritage globally.

5.2.3 The Participatory Digital Platform Model for Puju Opera Preservation in Shanxi, China

The development of a participatory digital platform model for the preservation of Puju Opera in Shanxi, China, necessitates an integrative approach that harmonizes cultural authenticity, technological innovation, and inclusive community engagement. Central to this model is the establishment of comprehensive digital archives that meticulously document scripts, audio-visual materials, and oral histories, ensuring the safeguarding of both tangible and intangible cultural elements (Hutson, 2023). To foster active user engagement, particularly among younger generations such as Gen Y and Gen Z, the integration of interactive features like gamification, virtual simulations, and user-generated content is imperative. These elements have been shown to enhance user immersion and facilitate deeper connections with cultural heritage (Wen & Xue, 2024). Moreover, the incorporation of immersive technologies like augmented and virtual reality offers dynamic and engaging experiences, effectively bridging the gap between traditional art forms and contemporary audiences (Technology Innovators, 2023). Social media platforms play a pivotal role in expanding the reach of Puju Opera, enabling widespread dissemination and fostering a sense of community among enthusiasts. Studies indicate that social media not only aids in the promotion of cultural heritage but also encourages participatory practices that are vital for sustainability (Ahmad et al., 2024). Institutional partnerships with universities, museums, and cultural organizations provide essential support in terms of resources, expertise, and policy guidance, ensuring the platform's long-term viability (Liew & Passau, 2024). Furthermore, the adoption of advanced technologies such as blockchain enhances data security and authenticity, which are critical for maintaining the integrity of cultural records (Barbash et al., 2024). Collectively, these components form a robust framework that not only preserves the rich heritage of Puju Opera but

also revitalizes its relevance in the digital age, ensuring its transmission to future generations.

5.2.4 Appropriateness of a Participatory Digital Platform Model for the Preservation of Puju Opera in Shanxi, China

The appropriateness of the participatory digital platform model for the preservation of Puju Opera in Shanxi is validated through its alignment with the needs of contemporary cultural preservation strategies, particularly its integration of technological innovation and community-centered design. The findings from this study resonate with Pang and Loo (2024), who emphasize that media-based curriculum development at Yuncheng University has played a critical role in institutionalizing traditional opera. This platform model supports similar goals by embedding immersive technologies, such as AR and VR, to facilitate interactive learning and broaden access to Puju Opera, especially for Gen Y and Gen Z users. The inclusion of user-generated content and real-time participatory features not only aligns with the participatory culture theory (Jenkins, 2006) but also reinforces the cultural legitimacy of the platform, as supported by research from Liang, Lu, and Martin (2021), which underscores the importance of public engagement in the sustainability of heritage via digital platforms. Furthermore, institutional collaboration, as a core component of the model, reflects the strategic frameworks outlined by Anwar et al. (2025) in their study on immersive heritage environments, which advocate for stakeholder-driven infrastructure to ensure long-term relevance. The congruence between expert evaluations and these scholarly perspectives affirms that the model is not only context-sensitive but adaptable for preserving other traditional performing arts in a digitally evolving society.

5.2.5 The Quality of a Participatory Digital Platform for the Preservation of Puju Opera in Shanxi, China

The quality assessment of the participatory digital platform for Puju Opera preservation demonstrated a high overall standard across key dimensions, particularly in cultural transmission, user engagement, and platform usability. This finding aligns with Zhao et al. (2025), who emphasize that immersive and interactive platforms

enhance users' cultural learning experiences and deepen emotional engagement. Moreover, the strong emphasis on multimedia integration and social media connectivity observed in the study corresponds with the conclusions of Buragohain et al. (2024), who argue that digital environments significantly expand public access and participation in cultural heritage initiatives. However, while multimedia and engagement features were highly rated, the moderate scores for historical content accessibility and platform navigation among Gen X users reveal areas that require further UX/UI refinement, a challenge similarly noted by Han (2024) in his study of digital heritage conservation. In addition, the expert endorsement of the platform's emphasis on security, data privacy, and user empowerment resonates with insights from Barbash, Petrenko, and Yepyk (2024), who highlight the necessity of addressing technological vulnerabilities to ensure sustainable cultural preservation efforts. Collectively, the findings suggest that although the platform successfully balances cultural authenticity with technological innovation, continuous improvements in user-centered design and inclusive accessibility are critical for maintaining its long-term relevance and effectiveness in promoting Puju Opera and similar traditional arts in the contemporary digital era.

Building upon the demonstrated quality of the participatory digital platform for Puju Opera preservation, future development must focus on enhancing inclusive engagement, sustaining cultural vitality, and expanding global outreach. First, to strengthen user-centered experiences, particularly for Gen X audiences who prioritized historical narrative clarity, improvements in adaptive UI/UX design are essential. As emphasized by Dima, Dima, and Epure (2024), immersive cultural experiences must balance technological sophistication with intuitive accessibility to foster deeper engagement across age groups. Second, to ensure cultural sustainability, the platform should incorporate community-driven storytelling models, enabling diverse voices to contribute to the evolving narrative of Puju Opera, following the participatory frameworks proposed by Jenkins (2006) and supported by the community-centered strategies outlined by Liew and Passau (2024). Third, expanding the platform's use of metaverse environments could foster global awareness and collaborative conservation efforts, as suggested by Buragohain et al. (2024), who argue that metaverse technologies enhance cross-cultural interaction and immersive

learning in heritage education. Moreover, continued integration of XR (Extended Reality) tools, guided by international standards as discussed by Anwar et al. (2025), would elevate the platform's ability to bridge physical and digital heritage experiences, making Puju Opera more accessible and resonant for future generations. Lastly, partnerships with educational institutions and cultural policy advocacy initiatives should be further institutionalized to secure funding, expertise, and policy support, aligning with the successful models of heritage digitalization described by Liang, Lu, and Martin (2021). These directions collectively emphasize that the future of Puju Opera conservation lies not merely in digital preservation, but in nurturing dynamic, participatory ecosystems that continuously adapt cultural heritage to contemporary human experience while safeguarding its authenticity for future generations.

5.2.6 The Perception of Audiences Towards Puju Opera on a Participatory Digital Platform

The study revealed that audience perceptions towards Puju Opera on a participatory digital platform were predominantly positive across different generations, highlighting the platform's success in making traditional performance arts more accessible and engaging in the digital era. Younger audiences, particularly Gen Y and Gen Z, responded enthusiastically to features such as gamified learning, social media integration, and mobile accessibility, aligning with findings from Liang, Lu, and Martin (2021), who emphasized that digital tools—especially social media—play a pivotal role in enhancing cultural heritage engagement among younger generations. The immersive and interactive nature of digital experiences also reflects Zhao et al.'s (2025) conclusion that virtual reality technologies significantly increase user engagement and cultural understanding. Meanwhile, older generations, such as Gen X, placed stronger emphasis on historical authenticity and structured archival presentation, consistent with Li (2024), who stressed the importance of preserving the integrity of cultural narratives for intergenerational transmission. However, some gaps in content personalization and the depth of interactive features suggest opportunities for further enhancement, particularly by incorporating user-driven storytelling models, as suggested by Dima, Dima, and Epure (2024) in their study on mixed

reality performances for heritage education. Moving forward, a balanced approach that combines rigorous historical documentation with dynamic participatory elements is crucial for sustaining audience interest and cultural relevance. This strategy not only supports the preservation and revitalization of Puju Opera but also provides a replicable model for other forms of traditional performing arts seeking to adapt to a rapidly evolving digital society.

To ensure the sustainable preservation of performing arts beyond Puju Opera, it is essential to tailor digital platform features that meet the distinct preferences of Gen X, Gen Y, and Gen Z. For Gen X, who highly value historical authenticity and comprehensive documentation, platforms should emphasize archival richness, expert-curated content, and high-quality multimedia exhibitions. Interactive timelines, annotated historical archives, and virtual museum tours could significantly enhance their engagement (Li, 2024). For Gen Y, whose learning habits are shaped by blended experiences, the integration of gamified learning modules, collaborative digital storytelling tools, and hybrid physical-digital events would align with their preference for participatory and experiential learning (Wen & Xue, 2024). Features such as "design your own performance" simulations or peer-review cultural competitions could foster active co-creation and innovation. Gen Z, being highly digital-native, requires instant, personalized, and socially driven experiences; thus, expanding short-form video content, AI-personalized heritage discovery paths, AR-enhanced mobile experiences, and integrating NFT-based digital collectibles could spark continuous engagement (Zhao et al., 2025). Social media integration must remain a core strategy across generations, promoting community-led storytelling and global accessibility (Liang, Lu, & Martin, 2021). Moreover, adopting metaverse-based participatory environments can create immersive, scalable virtual spaces for diverse traditional arts, supporting live performances, workshops, and intercultural dialogues (Buragohain et al., 2024). Overall, developing features based on cross-generational expectations while maintaining cultural authenticity will not only revitalize Puju Opera but also serve as a flexible, adaptive model for preserving various traditional performing arts in the digital era.

5.3 Suggestions

5.3.1 Suggestions from This Research

1) Preserving Cultural Authenticity through Expert Collaboration and Digital Archiving

Future platform development should prioritize collaboration with cultural scholars, artists, and heritage institutions to ensure the digital representation of Pujua Opera maintains historical authenticity and narrative integrity

2) Enhancing User Engagement via Interactive Technologies

Integrating gamification, user-generated content, and social media connectivity is essential, particularly to stimulate interest among Gen Y and Gen Z, whose engagement is driven by interactivity and immersive experiences

3) Ensuring Platform Sustainability through Hybrid Funding Models and Institutional Alliances

To secure long-term operation, it is necessary to adopt diversified financial strategies such as freemium models, crowdfunding, and sponsorships, alongside fostering partnerships with academic and cultural organizations

4) Improving Accessibility and Inclusiveness for Diverse User Groups

The platform should offer multi-language support, responsive UI/UX designs, and assistive technologies to accommodate users of varying linguistic, generational, and physical backgrounds

5) Strengthening Data Security and Establishing Ethical AI Frameworks

It is crucial to implement robust data protection protocols and ethical guidelines, particularly concerning AI-assisted restoration, content moderation, and community-generated narratives

5.3.2 Suggestions for Future Research

1) Longitudinal Studies on the Impact of Participatory Digital Platforms

Future research should evaluate how sustained digital engagement affects cultural transmission, identity formation, and community participation over time.

2) Cross-Cultural Adaptation and Comparative Studies

The adaptability of the participatory platform model should be explored across different traditional performing arts and cultural contexts to assess its universal applicability.

3) Exploring Advanced Immersive Technologies

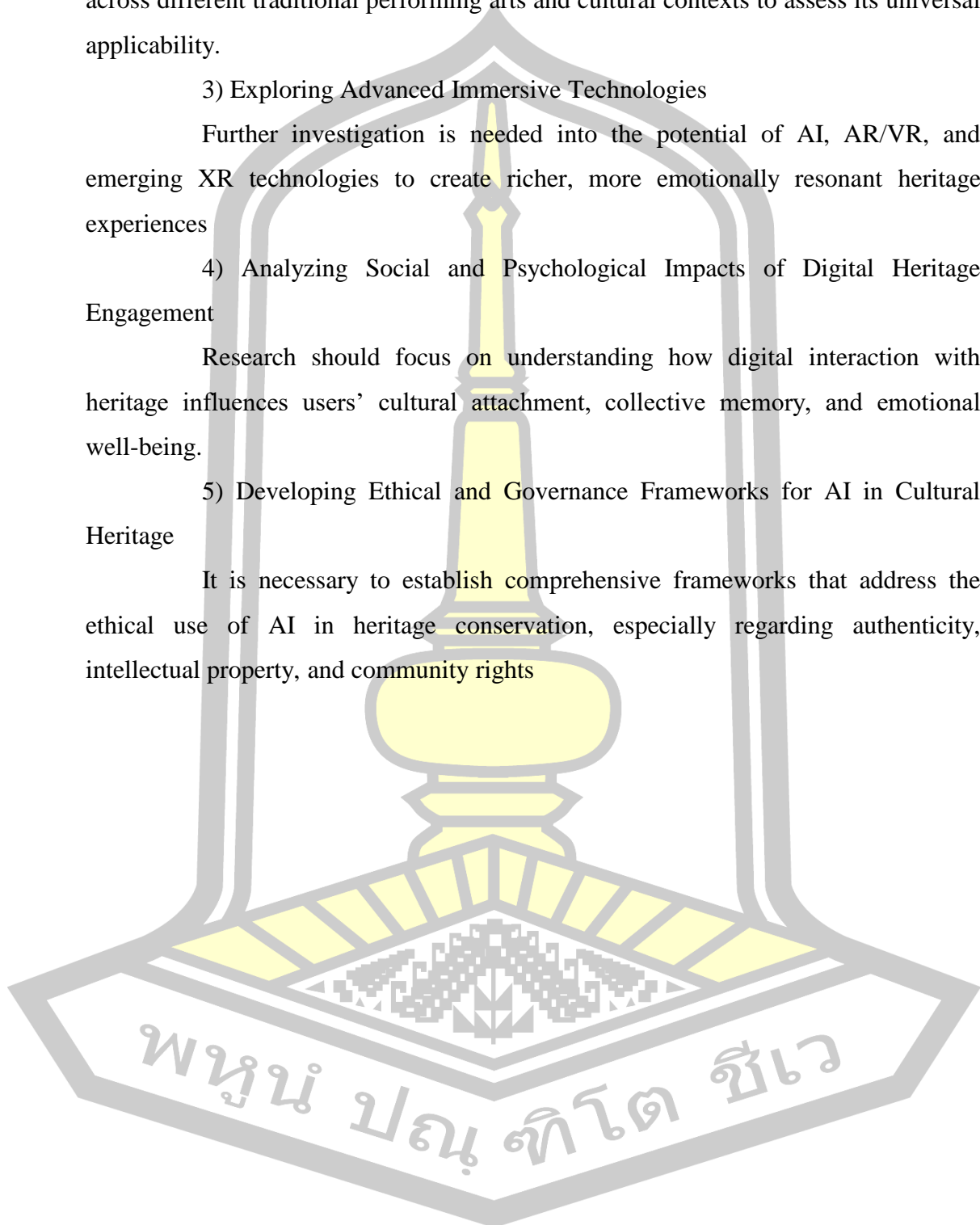
Further investigation is needed into the potential of AI, AR/VR, and emerging XR technologies to create richer, more emotionally resonant heritage experiences

4) Analyzing Social and Psychological Impacts of Digital Heritage Engagement

Research should focus on understanding how digital interaction with heritage influences users' cultural attachment, collective memory, and emotional well-being.

5) Developing Ethical and Governance Frameworks for AI in Cultural Heritage

It is necessary to establish comprehensive frameworks that address the ethical use of AI in heritage conservation, especially regarding authenticity, intellectual property, and community rights



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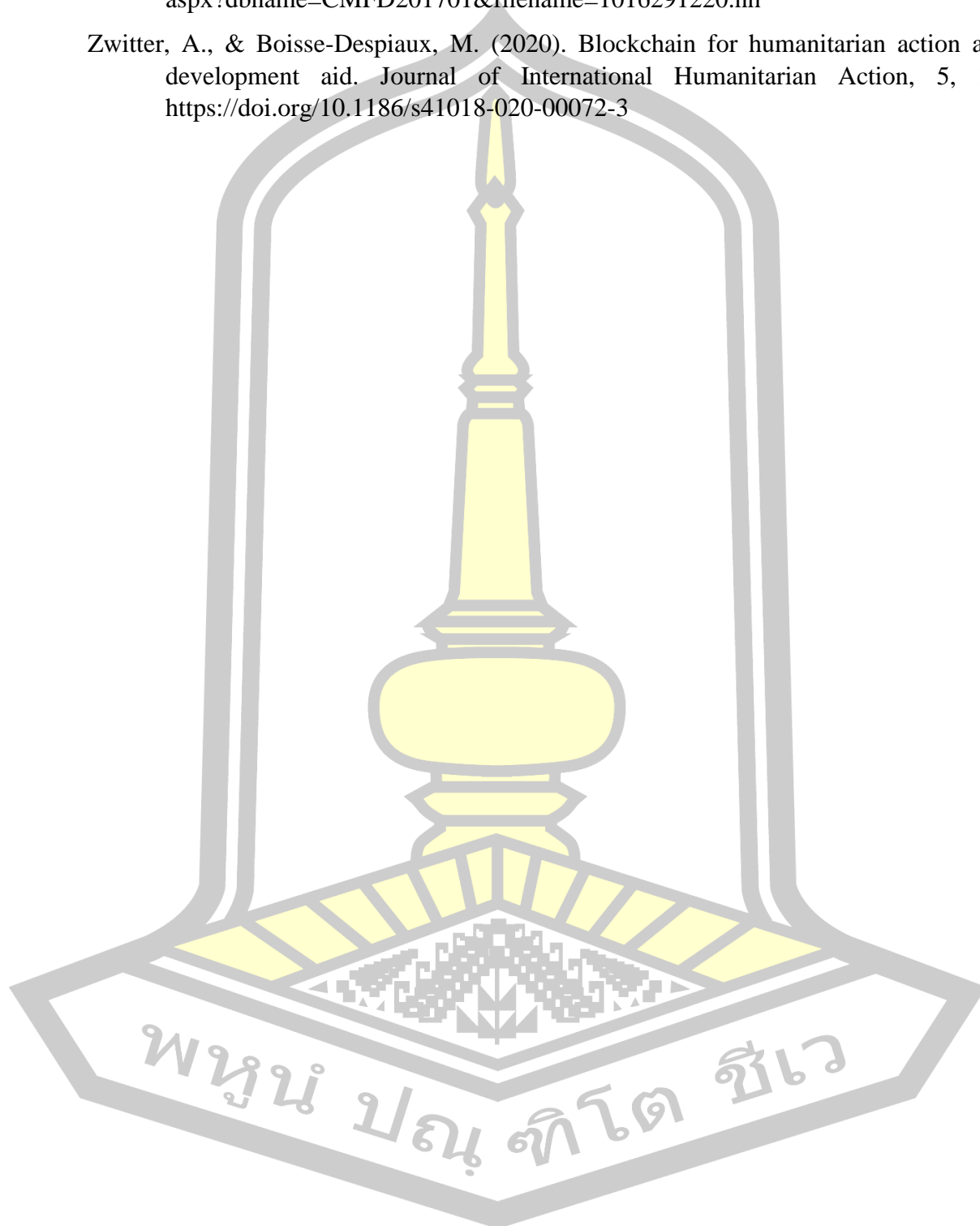
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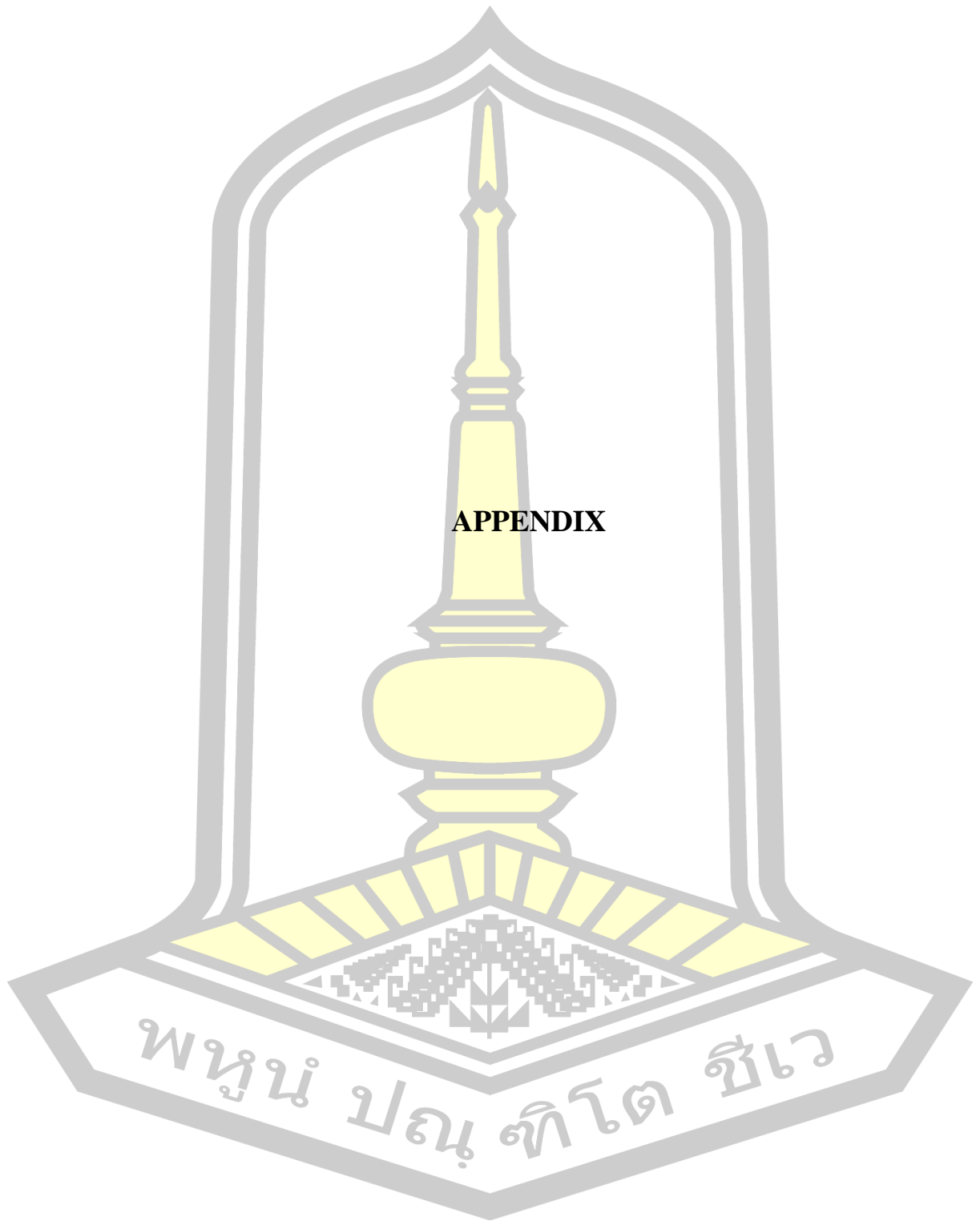
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APPENDIX

พหุ ประจักษ์ วิทยา

1. Collecting data on audience opinions on key components of a participatory digital platform for the conservation of Puju opera in Shanxi, China



Figure 1 Villagers fill out questionnaires



Figure 2 Villagers fill out questionnaires



Figure 3 Villagers fill out questionnaires



Figure 4 Villagers fill out questionnaires



Figure 5 Villagers fill out questionnaires



Figure 6 Villagers fill out questionnaires



Figure 7 Villagers fill out questionnaires



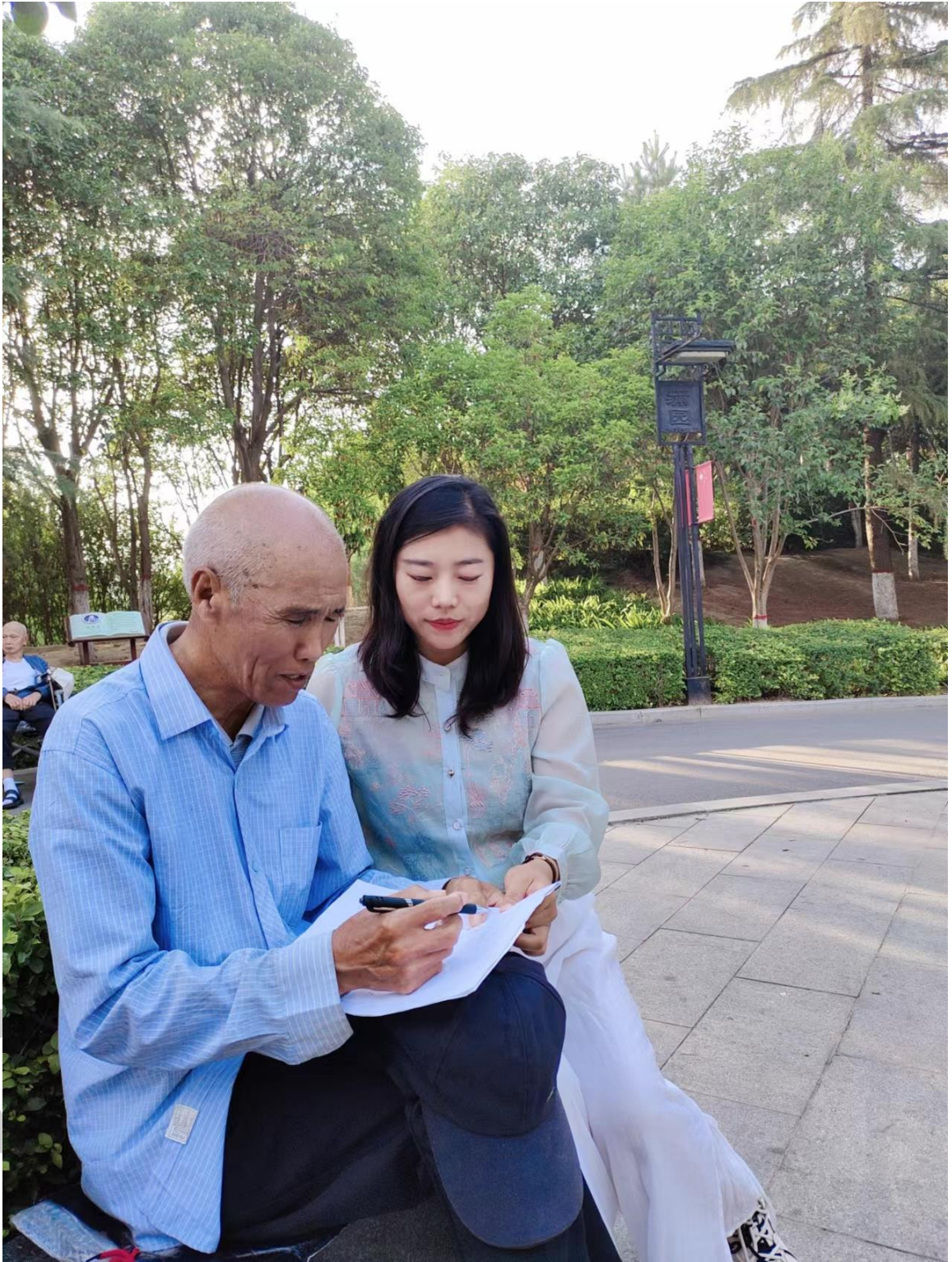


Figure8 Villagers fill out questionnaires



Figure 10 Pu opera performers are interviewed



Figure 11 Pu opera performers are interviewed



Figure 12 Pu opera experts interviewed



Figure 13 Pu opera performers are interviewed



Figure 14 Pu opera performers are interviewed

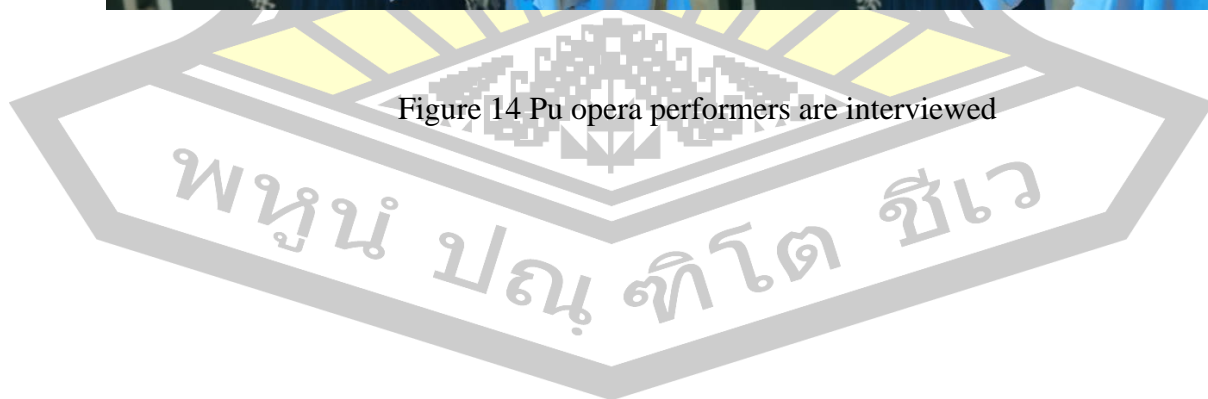




Figure 15 Pu opera performers group photo



Figure 16 Pu opera performers group photo

2. Research Tools

Interview Guide on Essential Components of Participatory Digital Platforms for the Preservation of Shan Xi's Puju Opera in China

Researcher's name: Ms. Min Liu Student ID: 65011261016

Research Title: Developing a Participatory Digital Platform Model for the Preservation of Puju Opera in Shan Xi, China

Program in: Ph.D. Major Creative Media Department of New Media Faculty of Informatics Mahasarakham University

Research Project Advisor: Asst. Prof. Dr. Kotchaphan Youngmee

Objective:

To study the essential components of participatory digital platforms for preserving Shan Xi's Puju Opera in China.

Research Instrument Statement for Interviewees

This interview is part of the research project titled " **Developing a Participatory Digital Platform Model for the Preservation of Puju Opera in Shan Xi, China.**" The aim of this study is to gather insights and perspectives from experts, digital platform developers, and cultural preservationists to inform the development of an effective digital platform for preserving Puju Opera.

The information you provide will be immensely valuable for this research and the development of the digital platform. We appreciate your willingness to share your thoughts and experiences regarding the key components necessary for preserving the cultural heritage of Puju Opera through digital technology.

The interview is expected to last approximately 30-60 minutes, depending on the topics discussed. All information you provide will be kept confidential and will only be used for research purposes.

Research Ethics and Interviewee Rights

1. **Voluntary Participation:** Your participation in this interview is entirely voluntary. You may decline to provide information or withdraw from the interview at any time without any consequences.
2. **Privacy and Confidentiality:** Your personal information and responses will be held in the strictest confidence. Any data that could identify you will not be disclosed in any reports or publications resulting from this research.
3. **Right to Withdraw:** You have the right to withdraw from the interview at any point. If you feel uncomfortable answering any questions, you may choose not to respond or terminate the interview without any repercussions.
4. **Use of Data for Research:** The information you provide will be used solely for research purposes and will not be utilized for commercial benefit or any other purposes without your consent.
5. **Data Security:** The data collected from the interview will be stored securely and protected from unauthorized access.
6. **Use of Audio and Visual Recordings:** This interview may be audio recorded to ensure accurate and comprehensive analysis of the data. If you prefer not to be recorded, please inform us in advance.
7. **Consent to provide information**

" I consent to provide my personal information in this questionnaire for research purposes and understand that I may withdraw from answering at any time."

" I confirm that I have read and understood the terms and conditions for participating in this questionnaire."

General Information of Interviewee

To enhance the completeness and coverage of the data analysis, we kindly ask you to provide the following preliminary information about yourself:

1. Gender

- Male
- Female

2. Age

- Under 25
- 25-29 years old
- 30-34 years old
- 35-39 years old
- 40-44 years old
- 45- 49 years old
- 50 years old and above

3. Education

- Bachelor's Degree
- Master's Degree
- Doctoral Degree
- Other (please specify)

4. Position/Occupation

- Puju Opera Expert
- Digital Platform Developer
- Cultural Conservationist
- Digital Communication Specialist
- Anthropology or Social Science Researcher

5. Years of Experience

- Puju Opera Expert
- 10-5 years
- 15-11 years
- 16-20 years
- More than 20 years

Topic 1: Essential Components of a Digital Platform for the Preservation of Puju Opera

1.1 What are the key components that should be included in a digital platform designed for the preservation of Puju Opera?

.....

1.2 Which aspects of the platform would facilitate easier access for users to the knowledge and history of Puju Opera?

.....

.....
.....
Topic 2: Features and Enhancing User Engagement

2.1 What features would enable users to engage more actively with the content and preservation of Puju Opera?
.....
.....

2.2 What are the best methods to foster engagement from youth or new user groups on this platform?
.....
.....

Topic 3: Cultural Preservation of Puju Opera

3.1 As an expert in the preservation of Puju Opera culture, which components of the platform do you consider essential for the long-term conservation of this culture?
.....
.....

3.2 How do you think a digital platform could facilitate the transmission of Puju Opera to future generations?
.....
.....

3.3 Are there any issues or challenges that the digital platform may encounter in aiding the preservation of Puju Opera?
.....
.....

3.4 What limitations or factors must be considered in the digital preservation of Puju Opera?
.....
.....

Topic 4: Quality Assessment of the Platform

4.1 What criteria can be employed to assess the quality of the digital platform for the preservation of Puju Opera?
.....
.....

4.2 In what aspects should this platform be evaluated, such as user engagement, user satisfaction, or effectiveness in disseminating culture?
.....
.....

Topic 5: Platform Usability

5.1 How should the digital platform be designed to ensure accessibility and ease of use for all user groups?

.....
.....

5.2 What approaches should be taken in utilizing the digital platform to preserve and disseminate Pujua Opera culture effectively for users?

.....
.....

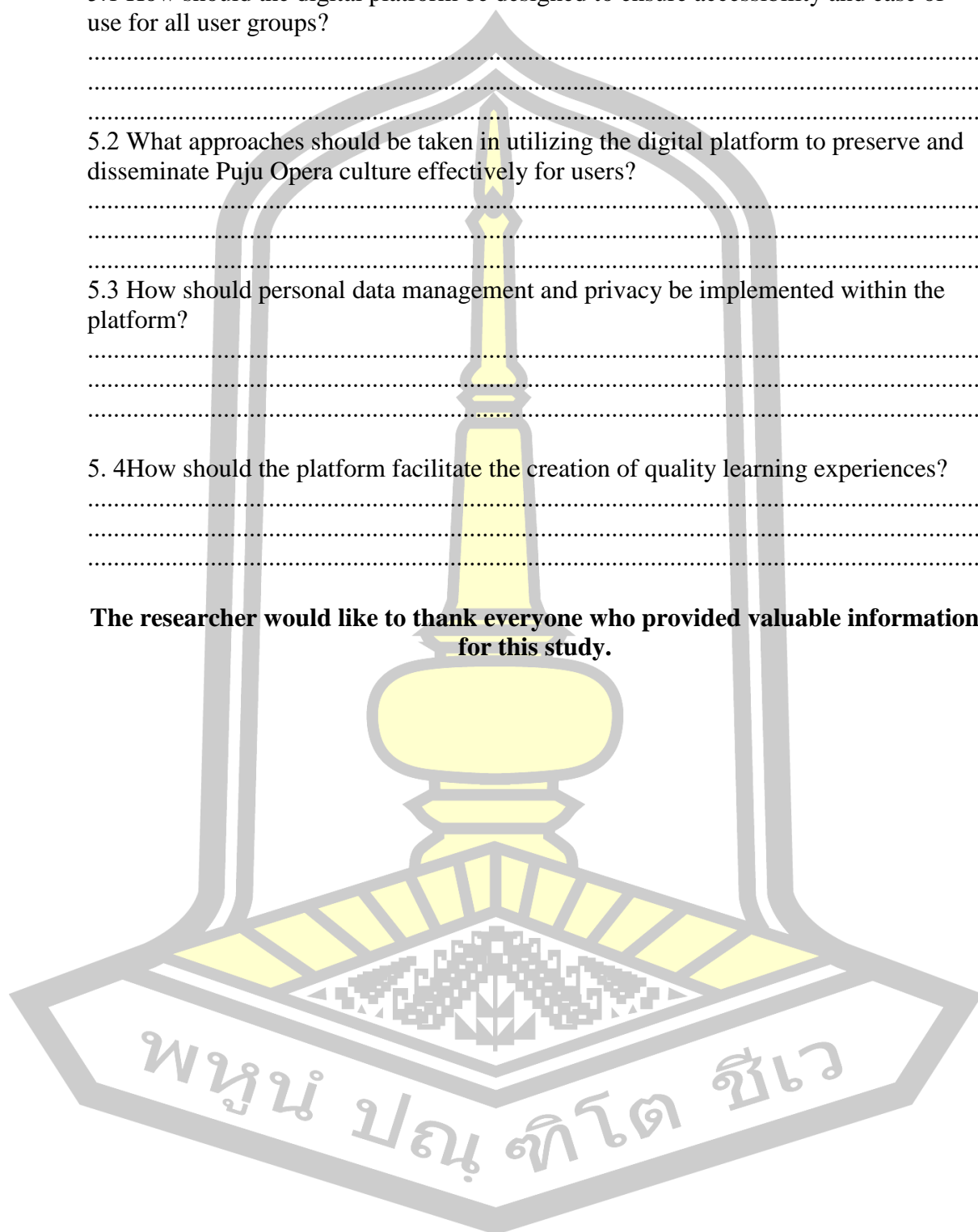
5.3 How should personal data management and privacy be implemented within the platform?

.....
.....

5.4 How should the platform facilitate the creation of quality learning experiences?

.....
.....

The researcher would like to thank everyone who provided valuable information for this study.



Survey on the Opinions of Young People Regarding the Key Components of a Participatory Digital Platform for the Preservation of Puju Opera in Shanxi, China

Researcher's name: Ms. Min Liu Student ID: 65011261016

Research Title: Developing a Participatory Digital Platform Model for the Preservation of Puju Opera in Shan Xi, China

Program in: Ph.D. Major Creative Media Department of New Media Faculty of Informatics Mahasarakham University

Research Project Advisor: Asst. Prof. Dr. Kotchaphan Youngmee

Objective:

To study the essential components of participatory digital platforms for preserving Shan Xi's Puju Opera in China.

Instructions for Evaluation

This questionnaire has been developed as part of a research study titled “Key Components of a Participatory Digital Platform for the Preservation of Puju Opera in Shanxi, China”. The objective is to gather the opinions of young people on the essential elements of a digital platform designed to preserve Puju Opera, a valuable cultural heritage of China.

Participation in this survey is entirely voluntary. The information you provide will be kept confidential and used solely for research purposes. The survey results will not identify individual respondents. You are free to stop participating at any time without any consequences.

Research Ethics for Human Participants

This study complies with the ethical standards for research involving human participants, ensuring the privacy rights and protection of personal information of respondents.

The data collected will be securely stored and will not be disclosed or used for commercial purposes.

The findings of this research will be presented in summarized and analyzed form only, with no disclosure of individual identities or personal data.

By completing this survey, you are giving consent for the information you provide to be used for research purposes.

If you have any questions or would like more information about this study, please contact the researcher phone number 0997823390 and Email 65011261016@msu.ac.th (provide contact information).

Consent to provide information

" I consent to provide my personal information in this questionnaire for research purposes and understand that I may withdraw from answering at any time."

" I confirm that I have read and understood the terms and conditions for participating in this questionnaire."

Part 1: General Information of the Evaluator

Please select the appropriate options:

1. Gender:

- Male
- Female
- Other

2. Age:

- Under 18
- 24-18
- 30-25
- 40-31
- Over 40

3. Educational Level:

- High School
- Undergraduate
- Graduate
- Other

4. Occupation:

- Student
- Working Professional
- Other

5. Experience with Digital Platforms for Cultural Preservation:

- Yes
- No

Part 2: Questions on Key Components of the Participatory Digital Platform for the Preservation of Puju Opera

Please rate each item on a scale of 1 to 5 (1= Strongly Disagree, 5= Strongly Agree):

Section	Components of a Participatory Digital Platform Items	Opinions level				
		1	2	3	4	5
1	Essential Components of the Digital Platform for Puju Opera Preservation					
	1. 1The platform should provide detailed historical information about Puju Opera.					
	1. 2The platform should include interactive features to engage users.					
	1. 3The platform must ensure ease of access to cultural resources for all users.					
	1. 4The platform should incorporate multimedia content, such as videos and images.					
	1. 5The platform should be user-friendly and accessible to diverse age groups.					
2	Features and User Engagement					
	2. 1The platform should include social media					

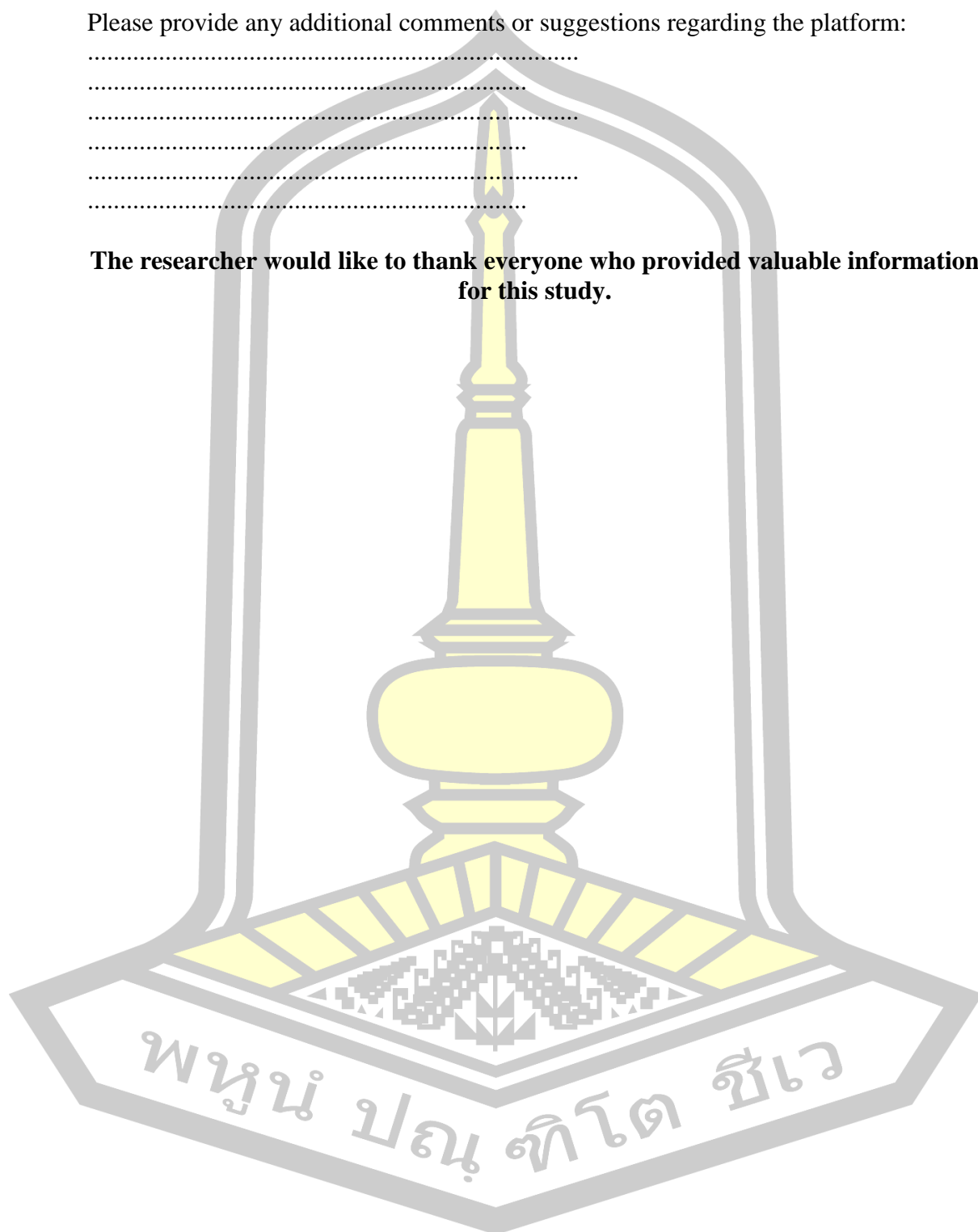
Section	Components of a Participatory Digital Platform Items	Opinions level				
		1	2	3	4	5
	integration to increase user participation.					
	2. 2Gamification features can enhance user interaction with Puju Opera content.					
	2. 3The platform should allow users to contribute content or feedback to enrich the platform.					
	2. 4Notifications and updates should keep users informed about new content or features.					
	2. 5Customizable user profiles can help tailor content to individual preferences.					
3	Cultural Preservation of Puju Opera					
	3. 1The platform should highlight the cultural significance of Puju Opera to younger generations.					
	3. 2The platform must provide educational resources to help users understand Puju Opera.					
	3. 3The platform should collaborate with cultural experts to ensure the accuracy of content.					
	3. 4The preservation efforts through the platform should align with traditional values.					
	3. 5The platform should foster collaboration with other cultural organizations.					
4	Platform Quality Assessment					
	4. 1The platform should be evaluated for its usability and ease of navigation.					
	4. 2User satisfaction should be regularly measured through surveys or feedback.					
	4. 3The platform should be assessed for its effectiveness in raising awareness of Puju Opera.					
	4. 4Performance metrics such as user engagement and content reach should be regularly monitored.					
	4. 5The quality of multimedia content (images, videos) should meet high professional standards.					
5	Platform Usage					
	5. 1The platform should offer a comprehensive user guide or tutorial for easy navigation.					
	5. 2The platform should allow users to easily access Puju Opera-related content.					
	5. 3Privacy policies must protect user data and ensure safe usage.					
	5. 4The platform should offer opportunities for learning and understanding Puju Opera.					
	5. 5Technical support should be available to users to address any issues.					

Part 3: Additional Suggestions

Please provide any additional comments or suggestions regarding the platform:

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The researcher would like to thank everyone who provided valuable information for this study.



Assessment Appropriateness Form for the Participatory Digital Platform Model for the Preservation of Puju Opera in Shanxi, China

Researcher's name: Ms. Min Liu Student ID: 65011261016

Research Title: Developing a Participatory Digital Platform Model for the Preservation of Puju Opera in Shan Xi, China

Program in: Ph.D. Major Creative Media Department of New Media Faculty of Informatics Mahasarakham University

Research Project Advisor: Asst. Prof. Dr. Kotchaphan Youngmee

Objective:

To assessment appropriateness the participatory digital platform model for the preservation of Puju Opera in Shanxi, China

Instructions for Evaluation

This assessment aims to evaluate appropriateness the "Participatory Digital Platform Model for the Preservation of Puju Opera in Shanxi, China", designed to conserve and promote Puju Opera through digital technology and user engagement. Experts in related fields are invited to assess the model to ensure its alignment with conservation goals and digital advancements.

Experts participating in this assessment are asked to evaluate each aspect of the platform model. The data collected will be used to improve the model's suitability and effectiveness. All information provided will remain confidential and used solely for research purposes.

Research Ethics for Human Participants

1. This study complies with the ethical standards for research involving human participants, ensuring the privacy rights and protection of personal information of respondents.

2. The data collected will be securely stored and will not be disclosed or used for commercial purposes.

3. The findings of this research will be presented in summarized and analyzed form only, with no disclosure of individual identities or personal data.

4. By completing this survey, you are giving consent for the information you provide to be used for research purposes.

5. If you have any questions or would like more information about this study, please contact the researcher phone number 0997823390 and Email 65011261016@msu.ac.th (provide contact information).

Consent to provide information

" I consent to provide my personal information in this questionnaire for research purposes and understand that I may withdraw from answering at any time."

" I confirm that I have read and understood the terms and conditions for participating in this questionnaire."

Section 1: General Information of the Evaluator

Please select the information that applies to you:

1. Gender

- Male
 - Female
 - Other
- 2. Age**
- 230
 - 40-31
 - 50-41
 - Over 50
- 3. Occupation**
- Puju Opera Expert
 - Digital Platform Developer
 - Cultural Conservationist
 - Digital Communication Specialist
 - Anthropology or Social Science Researcher
- 4. Education Level**
- Bachelor's Degree
 - Master's Degree
 - Doctoral Degree
 - Other (please specify) _____
- 5. Experience in cultural conservation through digital media**
- Yes
 - No

Section 2: Evaluation Appropriateness of the Platform's Suitability

Please rate the appropriateness of each component on a scale of 1 to 5 (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

Aspect	Appropriateness Form for the Participatory Digital Platform Model Items	Appropriateness level				
		1	2	3	4	5
1	Components of the Digital Platform for Puju Opera Conservation					
	1.6 The platform provides comprehensive information on the history and culture of Puju Opera.					
	1.7 The content is organized in an easily accessible manner.					
	1.8 The platform includes communication functions to enhance user engagement.					
	1.9 Multimedia presentations make the content more engaging.					
	1.10 The platform is designed to be user-friendly for all audiences.					
2	Features and User Engagement					
	2.6 The platform is designed to encourage active					

Aspect	Appropriateness Form for the Participatory Digital Platform Model Items	Appropriateness level				
		1	2	3	4	5
	participation from users.					
	2.7 Notification features help to maintain user interest.					
	2.8 Integration with social media increases awareness and engagement.					
	2.9 Rating or comment systems make users feel more involved.					
	2.10 Interactive functions enhance users' learning experiences.					
3	Cultural Preservation of Puju Opera					
	3.6 The platform promotes the transmission of Puju Opera culture to younger generations.					
	3.7 The content is accurate and aligned with cultural conservation standards.					
	3.8 Collaboration with cultural conservationists is evident in content development.					
	3.9 The content design adheres to cultural preservation principles.					
	3.10 The platform supports connections with other cultural organizations.					
4	Platform Quality Assessment					
	4.6 Ease of platform use.					
	4.7 User satisfaction with the platform.					
	4.8 Effectiveness in promoting cultural preservation.					
	4.9 Appropriateness of content and multimedia.					
	4.10 The platform's responsiveness to user participation.					
5	Platform Usability					
	5.6 The platform provides clear user guidance.					
	5.7 Users can easily access information.					
	5.8 Privacy policies are strictly adhered to.					
	5.9 The platform supports learning about Puju Opera.					
	5.10 Technical support is available for users.					

Section 3: Additional Suggestions

If you have any additional suggestions for improving the platform, please provide your input below:

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The researcher would like to thank everyone who provided valuable information for this study.

Quality Assessment Form the Digital Participatory Platform for the Preservation of Puju Opera in Shanxi, China

.....

Researcher's name: Ms. Min Liu Student ID: 65011261016

Research Title: Developing a Participatory Digital Platform Model for the Preservation of Puju Opera in Shan Xi, China

Program in: Ph.D. Major Creative Media Department of New Media Faculty of Informatics Mahasarakham University

Research Project Advisor: Asst. Prof. Dr. Kotchaphan Youngmee

Objective:

To evaluate the quality of a participatory digital platform for the preservation of Puju opera in Shan Xi, China.

Instructions for Evaluation

This evaluation aims to assess the quality of the “Digital Participatory Platform for the Preservation of Puju Opera in Shanxi, China,” which has been designed to preserve and promote Puju Opera through digital technology and user engagement. Experts in related fields are invited to evaluate this digital participatory platform to ensure it aligns with preservation goals and advancements in digital technology. The assessment items are on a 1- 5rating scale (1= very low quality, 2= low quality, 3= moderate quality, 4= high quality, 5= very high quality).

We ask participating experts to evaluate all aspects of the platform’s quality. The information collected will be used to enhance the quality of the digital participatory platform. All information provided will remain confidential and will be used solely for research purposes. Research Ethics for Human Participants

1. This study complies with the ethical standards for research involving human participants, ensuring the privacy rights and protection of personal information of respondents.

2. The data collected will be securely stored and will not be disclosed or used for commercial purposes.

3. The findings of this research will be presented in summarized and analyzed form only, with no disclosure of individual identities or personal data.

4. By completing this survey, you are giving consent for the information you provide to be used for research purposes.

5. If you have any questions or would like more information about this study, please contact the researcher phone number 0997823390 and Email 65011261016@msu.ac.th (provide contact information).

Consent to provide information

" I consent to provide my personal information in this questionnaire for research purposes and understand that I may withdraw from answering at any time."

" I confirm that I have read and understood the terms and conditions for participating in this questionnaire."

Part 1: General Information of the Evaluator

Please select the information that applies to you:

1. Gender

- Male

Female

Other

2. Age

Under 30

40-31

50-41

Over 50

3. Occupation

Puju Opera Expert

Digital Platform Developer

Cultural Conservationist

Digital Communication Specialist

Anthropology or Social Science Researcher

4. Education Level

Bachelor's Degree

Master's Degree

Doctoral Degree

Other (please specify) _____

Part 2: Platform Quality Evaluation

Aspect	Quality of a participatory digital platform items	Quality level				
		1	2	3	4	5
1	Components of the Digital Platform for Puju Opera Preservation					
	1.1 The platform content comprehensively covers the history and culture of Puju Opera.					
	1.2 The platform design is easily accessible and user-friendly.					
	1.3 The platform is optimized for various devices.					
	1.4 The information provided on the platform is accurate and reliable.					
	1.5 The platform offers a variety of learning media such as videos, images, and text.					
2	Features and User Engagement					
	2.1 The platform has features that allow users to give feedback or participate in content.					
	2.2 Using the platform is satisfying and convenient for users.					
	2.3 The system for exchanging comments and information among users functions well.					
	2.4 The platform encourages engagement from younger audiences.					
	2.5 The platform effectively stimulates interest and participation in cultural preservation activities.					
3	Cultural Preservation of Puju Opera					

Aspect	Quality of a participatory digital platform items	Quality level				
		1	2	3	4	5
	3.1 The platform's content complies with cultural preservation standards.					
	3.2 The platform promotes in-depth learning and understanding of Puju Opera.					
	3.3 The platform provides guidance on the preservation of Puju Opera.					
	3.4 The platform connects younger generations with local cultural heritage.					
	3.5 The information and activities on the platform promote pride in local culture.					
4	Platform Quality Assessment					
	4.1 The platform operates stably and reliably.					
	4.2 The visual and audio design of the platform is of high quality and appropriate.					
	4.3 The platform provides a good experience for learning about Puju Opera.					
	4.4 The platform content and features are continuously updated and improved.					
	4.5 The management of users' personal data meets security standards.					
5	Platform Usability					
	5.1 The platform's usage instructions are clear and easy to follow.					
	5.2 The organization of information and content on the platform allows users to access it easily.					
	5.3 The platform supports usage on a wide range of devices such as mobile phones, tablets, and computers.					
	5.4 The platform provides clear and understandable user guidance.					
	5.5 The platform enhances effective learning about Puju Opera.					

Part 3: Additional Suggestions

Please provide any additional comments or suggestions regarding the digital platform for the preservation of Puju Opera in Shanxi

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The researcher would like to thank everyone who provided valuable information for this study.

Perception Evaluate of the Younger Generation on the Participatory Digital Platform for Puju Opera Preservation

.....

Researcher's name: Ms. Min Liu Student ID: 65011261016

Research Title: Developing a Participatory Digital Platform Model for the Preservation of Puju Opera in Shan Xi, China

Program in: Ph.D. Major Creative Media Department of New Media Faculty of Informatics Mahasarakham University

Research Project Advisor: Asst. Prof. Dr. Kotchaphan Youngmee

Objective:

To evaluate younger generations' perceptions of preserving Puju Opera on a participatory digital platform.

Instructions for Responding to the Assessment:

1. This assessment aims to evaluate younger generations' perceptions of Puju Opera preservation on a participatory digital platform. It reflects their insights following active engagement with a digital platform developed according to the participatory digital platform model for Puju Opera preservation. This will provide an accurate reflection of younger generations' perceptions of Puju Opera preservation on a participatory digital platform. Respondents can rate each item according to the provided 5-point Likert scale: (1= Very low perceptions, 2= Low perceptions, 3= Neutral, 4= High perceptions, 5= Very high perceptions).

2. Participants in this assessment are requested to evaluate each aspect of the specified perception items. The data collected will be used to improve the effectiveness of the digital platform, and all provided information will remain confidential and be used solely for research purposes.

Research Ethics for Human Participants

1. This study complies with the ethical standards for research involving human participants, ensuring the privacy rights and protection of personal information of respondents.

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3. The findings of this research will be presented in summarized and analyzed form only, with no disclosure of individual identities or personal data.

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5. If you have any questions or would like more information about this study, please contact the researcher phone number 0997823390 and Email 65011261016@msu.ac.th (provide contact information).

Consent to provide information

" I consent to provide my personal information in this questionnaire for research purposes and understand that I may withdraw from answering at any time."

" I confirm that I have read and understood the terms and conditions for participating in this questionnaire."

Section1 : General Information

Please select the appropriate options:

1. Gender:

- Male
- Female
- Other

2. Age:

- Under 18
- 24-18
- 30-25
- 40-31
- Over 40

3. Educational Level:

- High School
- Undergraduate
- Graduate
- Other

4. Occupation:

- Student
- Working Professional
- Other

Part 2: Evaluate younger generations' perceptions of preserving Puju Opera on a participatory digital platform.

Please rate the perceptions of each Puju Opera preservation on a participatory digital platform on a scale of 1 to 5 : (1= Very low perceptions, 2= Low perceptions, 3= Neutral, 4= High perceptions, 5= Very high perceptions).

Section	Perceptions of Puju Opera preservation on a participatory digital platform	Perceptions level				
		1	2	3	4	5
1	Perceptions of Puju Opera and Local Culture					
	1.6 I have a good understanding of Puju Opera and its historical background.					
	1.7 Learning about Puju Opera through the digital platform has enhanced my understanding of Chinese culture.					
	1.8 This platform demonstrates the importance of conserving Puju Opera.					
	1.9 I feel that Puju Opera is an important cultural element that should be preserved for future generations.					
	1.10 The digital platform has helped expand my knowledge about Puju Opera performances and their history.					
2	Engagement and Learning through the Platform					
	2.6 Engagement through the platform has					

Section	Perceptions of Puju Opera preservation on a participatory digital platform	Perceptions level				
		1	2	3	4	5
	increased my interest in Puju Opera.					
	2.7 I feel that participating in this platform has deepened my understanding of Puju Opera.					
	2.8 Learning through this digital platform is beneficial for studying local culture.					
	2.9 I believe that engaging with this platform can help build a community of Puju Opera enthusiasts.					
	2.10 This platform has inspired me to learn more about Puju Opera and Chinese culture.					
3	Ease of Use of the Platform					
	3.6 I find this digital platform easy to use and accessible.					
	3.7 I can easily find information about Puju Opera on the platform.					
	3.8 This platform is designed to be user-friendly for all age groups.					
	3.9 I feel that the navigation system on the platform is clear and easy to understand.					
	3.10 I am able to explore the platform's content without any issues.					
4	Satisfaction with the Platform's Content and Features					
	4.6 I am satisfied with the quality of the content provided on this platform.					
	4.7 The content related to Puju Opera on this platform is engaging and appealing.					
	4.8 I find the platform's features encourage more user interaction.					
	4.9 This platform provides comprehensive information on Puju Opera.					
	4.10 The platform's interactive features make me feel connected to other users.					
5	Attitude toward Puju Opera Preservation in the Digital Age					
	5.6 I believe that conserving Puju Opera through a digital platform is an effective approach.					
	5.7 The digital platform highlights the importance of preserving Puju Opera in today's era.					
	5.8 I feel this platform can promote Puju Opera on an international level.					
	5.9 I believe that preserving Puju Opera in digital form supports sustainable content storage.					
	5.10 I feel that this digital platform will help generate interest among the younger					

Section	Perceptions of Puju Opera preservation on a participatory digital platform	Perceptions level				
		1	2	3	4	5
	generation in conserving Puju Opera.					

Section 3: Additional Suggestions

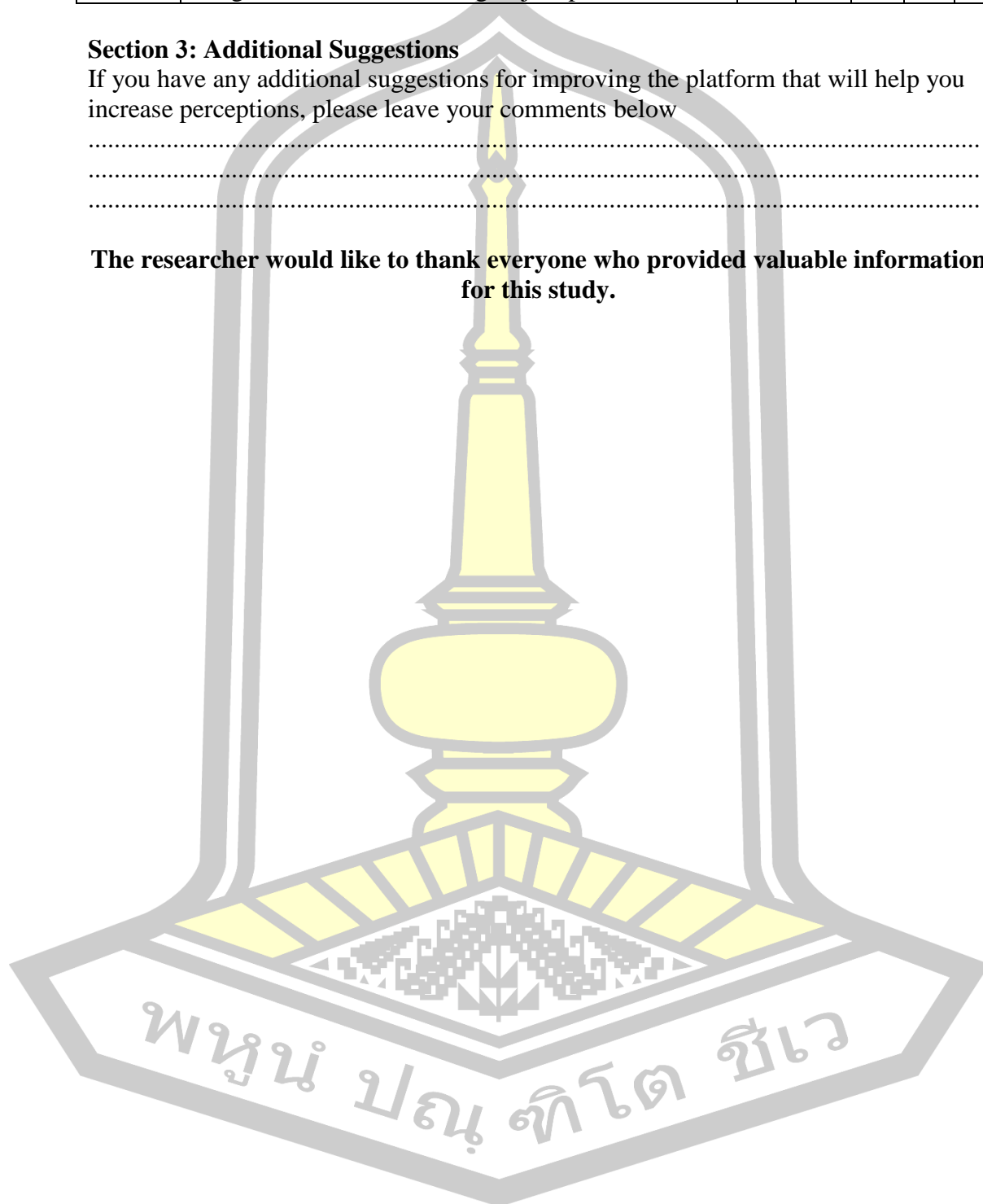
If you have any additional suggestions for improving the platform that will help you increase perceptions, please leave your comments below

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The researcher would like to thank everyone who provided valuable information for this study.



BIOGRAPHY

NAME	Min Liu
DATE OF BIRTH	July 26, 1987
PLACE OF BIRTH	Hebei, China
ADDRESS	40th Floor, South District, Wanhe County, Haigang District, Qinhuangdao City, Hebei Province, China
POSITION	Hebei, China
PLACE OF WORK	Beijing Academy for Performing Arts
EDUCATION	2006 - 2010 Bachelor's degree in radio and television at Hebei University of Media and Communication 2013 - 2016 Master's degree at the Graduate School of Hebei University of Media and Communication, majoring in scriptwriter in the field of radio and television 2021 - 2025 (Ph.D.) Visiting Scholar of the Chinese National Academy of Arts
Research output	<ol style="list-style-type: none">1. "The appropriateness of adapting thesis studies into films" was published in the academic journal "Cultural Industry", No. 24, 2018.2. "Innovation Analysis of Art Management from the Perspective of New Media" was published in the academic journal Cultural Industry, No. 29, 20203. The Performance Pattern of military-themed films under New Technological Means was published in the academic journal Oriental Wisdom, No. 34, 20214. The review article "Seeking artistic Expression for Xinjiang Culture in the New Era" was published on China Literature and Art Network 2022.4.125. The literary script "Meeting Love around the Corner" won the excellent works of the second International micro Film Exhibition of China Golden Rooster Hundred Flowers Film Festival in 20176. Literary review "Seeking artistic Expression for Xinjiang Culture in the New Era" was published in China Literature and Art Network on April 12, 20227. Literary review "Dunhuang Studies from an International Perspective: Reading" Seeking Dreams and Returning: A History of the Unification of Dunhuang Treasures "was published in China Art News on December 25, 20238. Literary review "The Interaction between Dunhuang Images and the Olympic Spirit from the Perspective of

"Integrated Culture" was shortlisted for the Third Online Literary Review of the China Federation of Literary and Art on December 20, 2022

9. Literary Review, "The Middle Field and Cultural Integration of the Construction of New Countryside in Hebei Chapter of Chinese Modernization Construction: A Review of the TV drama "The Most Beautiful Countryside", published in Hebei Literature Review on October 12, 2023

10. The essay "Rice Fragrance" was published in the supplement of "JinBao Bao" on December 2, 2023

11. The literary script "Memories Under the Ruins" won the Hebei Province Excellent Script Award on May 20, 2014

12. Literary screenplay "Luanzhou Love" won the Golden Crabapple Award at the 6th Asian Micro Film Festival

13. Literature Review "Looking for the Glory You Wrote with Blood in memory - A Review of the period drama "The Glory of the Fathers" was published in Handan Literature Review on September 29, 2013

14. The essay "Parents Love" was published in Qinhuangdao Daily on June 20, 2014

15. The short novel Yingzi was published in Qinhuangdao Daily on October 20, 2013

